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A

TREATISE ON ROADS,

THEIR

HISTORY, CHARACTER AND UTILITY;

BEING THE

SUBSTANCE OF TWO LECTURES

DELIVERED BEFORE THE

YOUNG MEN'S ASSOCIATION OF THE CITY OF ALBANY.

BY S. DE WITT BLOODGOOD.

ALBANY:

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INSCRIBED

TO THE YOUNG MEN'S ASSOCIATION

OF THE CITY OF ALBANY.

INTRODUCTION.

The writer of this, having been struck with the importance of giving that class of internal improvements, called ROADS, a due share of public consideration, at a time when so many projects are on foot, some of them addressed to the cupidity of speculation, others to advance the common welfare, recently attempted to investigate the subject, and to form some general opinions of its history, and characteristics.

No where could this information be obtained in the desired shape. And it was only after long and laborious researches that the scanty facts were obtained which form the groundwork of this little treatise.

Modern engineers have rather embodied their own experience in works relating to

particular projects under their charge, than discussed the general tendency of the system. Sir Henry Parnell, of the Institution of Civil Engineers, in London, has given us the most valuable work we possess of a general character, but he has not attempted to enter into those details which were found interesting enough, in our opinion, to justify their collection in the following pages.

If a general view of the subject, if its literary as well as mechanical history is worthy of being rescued from the dust of centuries, the writer hopes that his humble efforts will not be entirely in vain.

Albany, October, 1838.

TREATISE ON ROADS.

It is conceded that no age of the world was ever marked by a greater regard for the useful than that in which we live. The monuments of antiquity, grand and impressive even in their ruins, seem as often to have been erected through caprice as for utility. The pyramids survive triumphantly the ravages of time, but why such a vast expense was incurred of labor and of money, is one of the problems yet to be solved, and one that overtasks the most willing antiquarian. In our own time all popular pursuits appear to be influenced, if not directed, by a regard for the human condition and the desire of making it more in accordance with the true objects of life. The projector who cannot (apparently at least) demonstrate this to be the purpose of his schemes, is sure to be without patronage, and almost without hear-

ers. Even those articles of fancy and taste, once the exclusive property of the rich and great, but now obtained and enjoyed by the community at large, make their appeal to some principle of utility as their chief recommendation.

It is from this tendency of the age, that so much investigation, so much research, so much talent, has been displayed in popular forms, and sought each its reward in the practical advantages it conferred through a new medium on a new auditory. And it is from the consciousness of the truth of this feature of our times, that we venture to pass over more amusing themes, for one which is intimately connected with the comfort of individuals and the prosperity of nations.

The history of roads, those means of land communication, indispensable to civilization; without which mankind, and even those of the same country, would live strangers to each other; the absence of which is a sure evidence of barbarism, and whose maintenance and preservation are infallible tests of national prosperity, is a field vast enough for the ambition of the most successful writer. As at intervals these researches were prosecuted, they grew in interest and magnitude, and it is regretted after all that

the following pages will only present an outline of a subject, connected with the most remarkable periods of antiquity, their social, commercial and political relations, and which in our own time has assumed a still more important and interesting character.

When the celebrated Dr. Johnson declared, as he was whirled along in a post chaise over the beautiful roads of England, that he was enjoying one of the greatest pleasures of life, he overlooked the happiness, which the existence of good roads confers on those who do not travel, but who receive at their own doors, all that necessity demands, all that comfort requires, all that taste can sigh for. Human existence is pleasant or painful as its wants are satisfied or denied, and of course that system of internal communication which provides for them, becomes one of the first cares of civilized society, one of the great objects of all intelligent legislation.

In the savage state, the entire freedom of the individual, that natural liberty which does away with all restraints of law, and all subjection of our passions to reason, is accompanied by the most miserable dependence on circumstances. Nature, whose gifts

when cultivated and enjoyed, becomes the kind mother of the industrious and the provident, is to uncivilized man, at best but a fickle friend, and oftentimes a relentless enemy.

The wind which fills the canvass of the deep laden bark, and bears to its destined port the rich and useful products of other lands, tears down the wigwam of the savage and leaves him exposed and shelterless. The prosperous gale becomes the pitiless blast. The early and the latter rain which makes the husbandman rejoice in the bounty of Providence; which fills the reservoir, and impels the untiring wheel of the manufacturer, inundates the habitation of the aboriginal, swells the flood, over which he would pass, and deprives him of the scanty sustenance derived from his spear and his bow. Man in this state of existence becomes a wanderer. He must go to the tree or the fountain, to the lake or the hill side, where for a *time* he satiates his hunger and quenches his thirst. As the supply diminishes, at the greatest personal inconvenience he is obliged to seek some other spot where he may prolong his life. His food must be run down on the prairie from the herds, which nomades like him-

self, have a wild and uncertain existence, or drawn at times from ice-bound lakes, with slow and painful exertion. The tribe of which he is a member cannot establish their residence any where permanently, if they would. Their sustenance must be sought, where it can be found, since it cannot be conveyed to them, and their surplus for the moment, hid in the earth for future necessity, generally becomes the prey of other tribes, or of the quick scented animals, which follow on the trail. Life is consumed in a struggle for life, and the nobler qualities of our nature have no time for expansion, and no place for improvement. Without permanence of habitation and constant facilities for intercommunication, no progress in civilization can be counted on.

All travellers tell us that the native tribes of uncivilized lands, are constantly exposed to the horrors of starvation; while political economists appeal triumphantly in their arguments in favor of commercial intercourse, to the fact that in refined and civilized nations, famine is now unknown. The startling and affecting pictures such as are presented to us by Captain Back, and Washington Irving, in their most recent works, of

the frequent horrors which attend the northern and northwestern tribes, and arise from the scantiness or uncertainty of their supplies of food, are unfortunately too common, and the eye of humanity cannot glance at the great mass of mankind, and notice the millions and millions of our race living in anarchy, in poverty, and in ignorance, without shedding a tear of compassion over their strange and hapless destiny. Nor is it merely in regard to the physical condition of man, that the absence of intercommunication as enjoyed in civilized countries, is so great a misfortune. To the early settler who finds the dangerous river, the stormy flood, and the trackless forest interposing insuperable obstacles to the transportation of food, and to the poor savage who after killing his game, is unable to carry it to the tent where his wife and children are dying of hunger, other and more valuable benefits are denied by the absence of those improvements which distinguish the civilized state. Animal existence most concerns the barbarian, but among men in civilized life, it is but an accessary to the growth of the higher principles of our nature. In a constant struggle against the elements for the support

of life, its nobler objects are lost sight of, or unappreciated, and it is a matter of fact, that those nations are most degraded, whose means of subsistence are the most precarious. It would be a curious subject of enquiry to ascertain and compare the relative degrees of civilization to be found in those countries, which are partially or wholly deficient in the means of intercommunication. A table might be formed with considerable accuracy which would shew their actual condition by means of this test. The most barbarous people will be found to be those, among whom the system of roads, bridges and canals, and the facilities of transportation are unknown. On the contrary, the most enlightened and the most prosperous, are those whose inhabitants live in the closest connections, social and commercial, whose territory is intersected in all directions by well constructed and densely thronged avenues, and whose means of travel and of trade, have bound its inhabitants in friendship, and the ties of interest.

Let us elucidate this principle by reference to well known facts. Even to civilized nations, those indeed having extensive domains, and great political connections, it will be

found applicable. We are all familiar with the history and resources of Spain. That country which by turns has been the theatre of Roman, Moorish and Gallic conquest, though the land of the olive and the vine, and the home of the richly freighted galleons, is still the scene of ignorance and poverty. It has not improved the advantages, nor overcome the disadvantages of nature. "No man" says a recent distinguished traveller, "but a botanist can travel with any pleasure through the barren tracts of old Castile." The easy prosecution of internal improvements is unquestionably rendered difficult by the character of the surface, but the Spanish government at one time projected a grand canal to connect the Mediterranean with the Bay of Biscay, by the route of Asturias, old Castile and Arragon. Only a small portion of this work was ever finished, and the transactions connected with it are of course very limited. This is almost a solitary effort on their part to facilitate their internal navigation. The main roads to the capitol and some of the chief towns, are kept in good order, as a well understood matter of necessity, but the general communications of the country, and those by which the trans-

portation of goods is effected, are little else than the imprinted footsteps of the weary mules, upon the rough rocks which they are compelled to climb. The consequences of this state of things are apparent in the difficulty and danger of conveying merchandize from one part of Spain to the other, the heavy and ruinous charges made by the carriers for their services, the temptations to plunder afforded by the insecurity of the routes, and the scarcity, and dearness of a vast proportion of the articles indispensable to the comforts of life.

On a recent occasion, when a supply of grain was required by the government at Madrid, it took 30,000 horses and mules to transport 480 tons of wheat from old Castile to that city. On a good turnpike road, this would have easily been accomplished by one sixth of that number of animals; on a canal at a speed of four miles an hour, by about fifteen, on a rail way, by the exertions of two locomotive engines of the first class.

The city of Cadiz though founded 1200 years before the Christian era, contains even now but 60,000 inhabitants, and though admirably situated for foreign trade and so far coming within the general law which causes

the rise of towns and cities, and which we shall presently notice, yet for the want of proper channels of communication with the interior, and the oppressive duties charged upon articles of merchandize every time they change hands, it never can become as populous or important as those great European and American towns which are centres of innumerable avenues, the points in which the vivifying rays of commerce are concentrated.

On the other hand, Switzerland, a mountainous and sterile country, with only about 19,000 square miles of territory and 2,000,000 of inhabitants, while Spain possesses an area of 179,000 square miles and 41,000,000 of inhabitants, is essentially prosperous, in consequence of its internal communications, and the facilities they afford for travelling, and the export of domestic industry. The celebrated military road called the Simplon, which will preserve the memory of Napoleon, longer perhaps than even his famous battles, has produced the most important commercial advantages to the Helvetians. Another over the Splugen, the work of the Austrians since the death of Napoleon, and designed to facilitate the communication between Lombardy and the Tyrol has also had

the most decided influence on their prosperity. The two cantons of Uri and Tessino completed about seven years since, a fine avenue over St. Gothard, and indeed good roads are every where carried to the very tops of the Swiss mountains. Industry has thus found an outlet, and the very attractions of the scenery thus rendered accessible to the curious, form an item of the national prosperity that would scarcely be believed, were it not for unquestionable evidence.

The condition of society under a system of intercommunication rises at once to the highest degree of refinement, and the greatest equality of advantages. The most distant places, are to all desired intents, completely united. The products of every nation, the fruits of every clime, come within reach of all. The pleasures of social intercourse, the beneficial discoveries of science, the offerings of genius, and the works of art, become part and parcel of his enjoyment, who lives within the circle of civilization, penetrated by these lines of commercial intercourse. The inhabitants of the torrid and the temperate zones, exchange with eagerness the surplus of their respective products. No one *need* be beyond the reach of

sympathy or companionship. The loneliest inhabitant, whose possession is crossed by a canal or rail-road, becomes in fact a citizen of the world.

It is impossible not to be struck with the moral effect of such a state of things. The bonds of human fellowship become closer and dearer to us, the friendly relations which Christianity teaches us, are strengthened and maintained.

> "The kindred sons of men
> Live brothers like, in amity combined."

Before we proceed to examine the history of roads, it may be well to glance briefly at the principles to which they owe their origin, and some of the benefits of their construction. It is evident, on the discovery or early settlement of any country, that the first efforts of the founders to establish colonies, are made at the sea side, or on the banks of navigable rivers. These are the only localities easily accessible to foreign commerce, or the trade of the interior, and thus all great cities and towns generally owe their rise to their facilities for water communication. This fact is pointed out by all political economists, and in this necessity, they recognize the choice usually first made by colonists.

When a city or town is thus established, its subsequent growth still depends on the ease with which it can be approached, and the extent of country which can readily find there an outlet for its productions. In barbarous ages, the protection of a castle and the favor of a chieftain sometimes congregated men in hamlets beneath a lordly battlement, but where civilization extends her ægis over her followers, men cannot be kept together in large masses, for the mere and single purpose of personal safety. They resort to populous towns, and towns become populous because they are the marts of enterprise. Here, we see the advantages of the subdivision of labor, and the increased production and sale of those articles which minister to our real or imaginary wants. Here, industry moves on the largest scale, the arts flourish in the highest degree, and the comforts of life are most easily attainable. In the competition of intelligence and talent, great designs are brought forward to public observation, great public benefits are secured, and the highest rewards held out to perseverance and industry. Talent generally repairs to the largest theatre of action; and the eagerness of adventure, and the rapid

advancement of enterprise, draw crowds of combatants into the already thronged arena.

When cities become so large however, as to require new and more steady supplies, than at their outset,—whether for manufacture, export or subsistence, then it is the extension and improvement of internal communications become indispensible to further prosperity. There seems to be a reciprocal action. Towns require the construction of roads, and roads lead to the increase of towns. They are the artificial substitutes for water communication, and by bringing the productions of the surrounding country to market, induce competition, and give the citizen his necessary supplies, at cheaper rates, and in more convenient quantities.

The surrounding country becomes equally benefitted. The remote sections are brought upon an equality with those nearer, by the reduction of the expense and difficulty of land carriage, and thus gain a market they could not otherwise profitably visit. Lands that could not before be worked with any prospect of sufficient remuneration, become valuable to their owners and beneficial to the public. The influence that large towns exercise upon agricultural pursuits, is well understood.

"In those districts," says a modern writer, "which carry on a communication with the markets of trading towns, the husbandmen are busy and skilful, the farmers industrious, the land is managed to the best advantage and double the quantity of grain or herbage (articles ultimately converted into human provision) raised from it, of what the same soil yields in remoter and more neglected parts of the country." "Agriculture never arrives at any considerable, much less its highest degree of perfection, when not connected with trade, that is, when the produce is not increased by the consumption of trading cities." Nor are the benefits conferred by these "greatest of all improvements" confined exclusively in their operation, to town and country only. They are equally striking, by the effect they produce in the relations between district and district. Articles of necessity however bulky, are easily transported to be manufactured or consumed. The products of the soil, of the rivers, and the mountains, are interchanged at will, and the gifts of heaven which would otherwise often be unappreciated and unimproved become the valuable resources of the human family.

The diminution of the expense of transportation is also an important consideration, since all the saving effected in the cost of transportation to market, is so much profit left in the pocket of the producer.

The advantage of being able to convey any required product, to the place where it is in demand, and within the period of its greatest value, lessens the risk of production, and gives certainty to the calculations of industry. In the conveyance of news and of private correspondence, the utility of roads is strikingly evident, and particularly that of rail ways, a simple yet admirable invention which leaves the most remarkable efforts of the ancients far behind. The separation of friends and relations becomes almost nominal, the sympathies of life are uninterrupted by distance, and all the joys of affection and the sweets of remembrance multiply in the pleasing assurances, which their swift messenger, so faithfully conveys to the absent.

In a military point of view, good roads are of essential service. It is too apparent to need any proof, that the rapid transmission of troops from one point to another is of the highest importance to any belligerent

country. If during the second war of independence, our present system of canals and rail roads had been established, immense savings might have been made in the expense of transportation; and the same number of men might have been used oftener at different points and doubled in efficiency. In any future contest, the advantages will be perceived in the most striking manner.

These topics at which we have only glanced, are fruitful subjects for reflection, and deserve a more deliberate examination than our limit enables us to give them.

The early history of roads is somewhat obscure. In tracing it out, we naturally turn to the oldest records in the hands of men, to see what is there said of them. The commerce of the east appears to have been carried on by means of ships and caravans, and allusions to these are frequent in the early writers. We find that the Egyptians pursued the retreating Israelites with chariots, which is perhaps the most ancient notice we have of their general use. Among the Jews the absence of commercial regulations, in the laws promulgated by Moses, was doubtless owing to the necessity of keeping that people separate as much as

possible from the idolatrous nations around them.

In the time of Solomon immense numbers of these chariots were imported from Egypt. The numbers are stated with precision by the early historians, and the fact of their use, in default of other evidence, would be conclusive as to the existence and maintainance of public roads. Two great routes from Palestine to Egypt, the one along the Mediterranean from Gaza to Pelusium, and another from the same place to the Arabian gulf, are spoken of as being constantly thronged by travellers.

On the downfal of the Israelites after the death of Solomon, occasioned by various causes foreign and domestic, Tyre became the emporium of the eastern world. Besides her foreign commerce which was already so extensive as to have attracted the attention of the inspired prophets, and to have procured for her the title of "a merchant of the people for many isles," her internal trade was of the greatest extent. Her principal connections were with Egypt, Assyria, and the Caucasian countries, while the tin of Britain and the silks of China were also found in her marts. When the walls of

Rome were so diminutive that they could be easily leaped over, Tyre was in the "blaze of her fame." While her vessels whitened the adjacent seas, her caravans threaded the interior. The trade of Phenicia has given occasion to some very profound researches of which the pages of Heeren furnish a masterly example. The celebrated city of Petra, recently so well described by our countryman Mr. Stevens, became a city of immense wealth, from the mere circumstance of the meeting of the caravan roads in its vicinity, and its being the emporium for the supplies of Arabia.

Babylonia or Chaldea, a province of Assyria, which also like its later rival Tyre has yielded to time and prophecy, was also remarkable for its commerce, and the numerous commercial roads, by which the city of Babylon gathered in the products of surrounding countries. One celebrated route ran along the southern boundary of the desert between Persia and Medea to the Caspian Gates, a celebrated Asiatic defile; and thence along the Hyrcanian and Parthian mountains to Bactria. It is said to have been used by Alexander in his celebrated expedition against the Bactrians, and is styled by

Arrian a Greek geographer, the great military road. The principal commercial route from Babylon to India was in part the same, but at Aria it took an easterly direction and afterwards divided into three branches. Other roads are mentioned which ran to the Mediterranean, and to important towns in Asia Minor. Semiramis, who if not the founder of Babylon, was the creator of its commerce and its splendor, particularly directed her attention to the construction of roads and bridges, which according to Strabo were of "wonderful structure."

There is evidence of the existence of regularly constructed roads in Asia of great extent, divided into stations, at which the most spacious inns were erected for the security of travellers. That from Susa a sea port of Tunis to Sardis, a town a little east of Smyrna, traversed a distance of 312 miles, and had no less than 111 of these caravanseras.

Among the eastern nations celebrated for their internal commerce, was Arabia, situated between the Red sea, the Persian gulf and the Mediterranean, and thus peculiarly situated to enjoy a carrying trade.

The principal mode adopted by the Asia-

tic and African merchants for the transportation of merchandize, was that of caravans, and the use of them has continued to this very day. Travellers who describe them, present us a picture of eastern customs, which carries back the mind to the earliest periods of Eastern history. The camel, that ship of the desert, the gift of heaven to eastern nations alone, still forms their chief dependence in their internal trade. Those who wish to learn the details of caravan travelling, will find them fully described by Niebuhr, and Buckhardt.

The routes now followed in Africa, are no less than seven in number, occupying from 30 to 119 days, and traversed frequently by as many as 2000 camels. The principal articles of traffic are Indian goods, slaves, gold dust, drugs and ivory. The principal caravan route is from Nubia to Cairo. Another is that from Damascus to Mecca, and Cairo to Mecca. Into the great caravans, smaller ones are continually merging as they move along, and the mixture of business and religion allowed by the Koran, keeps Asia and Africa dusty with the feet of merchant pilgrims. The limits necessarily assigned to this treatise, compel us to turn with reluctance from this interesting portion of the subject.

The states of Greece, which are always the favorite haunts of the classical antiquarian, do not furnish the same field to the utilitarian, as to the lover of the fine arts. Something is to be allowed to their peculiar position, when it is known that their trade was chiefly maritime, and their roads were of secondary consequence. We have ample descriptions of their temples, their fleets, their public men, their domestic manners, and their foreign wars, but it is almost impossible to ascertain with minuteness the character of their inland communications. The road from Athens to the Pireus, its artificial sea port, and the sacred road to Eleusis are often alluded to, and the former is particularly described. There was plenty of material for the construction of roads. The quarries still remain, out of which, though towns and cities were for ages hewn, as many more might yet be constructed. Continental Greece appears to have been a collection of basins of level land surrounded by lofty and romantic mountains. Each basin shut out from the other, seemed naturally to form an independent territory, and communicated only by the natural outlets through the mountains. The roads ran through these

defiles, and over the plains, very much as they now do. Indeed from their present character and appearance, we are led to infer that they were generally causeways of stone rather roughly laid, with a narrow surface.

Tournefort however tells us, that he found in the island of Cos, now Stanco, in the Egean sea, a road that ran from Iolis to Carthea, paved with regular polygons, supported by a strong wall, and this again protected by immense blocks of coping. He succeeded in tracing it for three miles. The roads leading from Athens to the country, were bordered with statues and monumental erections in honor of the great men of the country. There, the effigies of the illustrious met the eye of the traveller, and reminded him, if he had forgotten it, of the respect due to great and virtuous actions.

Pausanias a celebrated traveller of Cappadocia who flourished in the second century, and left behind him a description of Greece made from personal observation, gives us many particulars of a highly interesting nature. He mentions the road leading from the Academy to one of the gates of the city, as being lined with public sepulchres. Not the least of those thus honored with monu-

ments at the public charge, was Thrasybulus, the conqueror of the thirty tyrants, who for this service boldly planned, and bravely executed, refused to receive any other reward, than two twigs of the olive entwined in a simple wreath. The names of Pericles, of Apollodorus, Timotheus, Zeno, Nicias and Aristogiton, all highly interesting and distinguished characters, were also found by the traveller inscribed with equal care in the same vicinity. Among other roads mentioned by him, is one which ran from the forum in Sparta to another place called Booneta, celebrated as the Aphetean road,* so named after a port of Thessaly, upon which, Ulysses ran a race against other competitors, and won the hand of the far famed and faithful Penelope.

Perhaps there was no part of Greece where a good road would have been more advantageous to the country, than across the isthmus of Corinth. On looking at the map it will be perceived, that such a road would cut off a tedious navigation round the Morea, uniting the gulfs of Lepanto and Egina. The distance across is only four or five miles, and the ancients traversed it in preference to sailing round. Nero it is said,

*Note.—Now Fetio.

attempted to cut a canal through the isthmus, but had only proceeded with the work for half a mile, when some disturbances at Rome prevented him from executing his design. Some fears were entertained by cotemporary engineers, if such they might be termed, that the waters of the Ionian sea were higher than those of the Egean, and would overflow the islands in the gulf of Egina, as well as the low land of the isthmus. Corinth, which principally benefitted by this inland traffic, became possessed of immense wealth, and a decided influence over the other Grecian states. When the Romans sacked it, 146 years before the Christian era, they were astonished at the vastness of their booty.

As these warlike people extended their conquests to that part of the world already accustomed to the sway of foreigners, they carried with them the spirit of colonization. Greece was made a province, and was governed by a pro consul. Roads, as will presently be noticed, were immediately constructed of such durability as to have lasted to the present day. That from Beirout to Mount Lebanon, built by the emperor Aurelius, and called the Vi Antonina, is still to be

traced, and the inscriptions commemorative of the event, may yet be seen engraved on the mountain heights along which it passes.

Although the political economy of the Grecian states is but imperfectly known in those particulars which are connected with our subject, yet occasionally we find vestiges of customs, and relics of history, which enable us to grope our way with some degree of certainty. So the artist pronounces from the foot, that it is Hercules whose statue is before him, and the geologist, from the scattered fragments of the fossil fish determines its structure and habits, when thousands of years ago it swam "the waters like a thing of life." The care of the streets and highways in Thebes must have been committed to persons who were chosen for that purpose, although it is difficult to tell in what manner they exercised their duties. For on one occasion, its ungrateful citizens by way of exhibitiug their contempt for their countryman Epaminondas, elected him a telearch, or cleaner of the streets, one of the lowest of their public offices. That illustrious person, pronounced by Cicero one of the greatest men of any age or nation, who had bled at Leuctra, and led his

countrymen to victory, was so unfortunate as to be unsuccessful in an attack upon Corinth, and thus lose their favor. He, who resisted the rich presents of a Persian monarch, though he lived a life of poverty and self denial, had not so secured the favor of the fickle crowd, as to escape their persecution and denunciation. Instead of complaining of the appointment which was intended to cover him with contempt, he immediately entered upon its duties. In his opinion, even the humblest office claimed a faithful execution, and it is the province of genius to touch nothing that it does not adorn. Epaminondas, by this manly conduct, not only won the repentant love of the Thebans, but so elevated the character of the despised telearch, that the place afterwards was eagerly sought for, as a mark of honor, and the public favor.*

The Roman roads are almost as familiar to the moderns, as those of their own times. When the whole world, as then known, was tributary to Rome, and her Eagles had been planted on the confines of Europe, Asia, and Africa, she took care to construct and main-

*The new Greek government has recently employed itself in making a McAdamised road to the Pireus which is well spoken of.

tain roads in every country she had conquered. In the time of Augustus, the limits of the empire on the west, were the Atlantic ocean, on the east the Euphrates, on the north the Danube and the Rhine, on the south the cataracts of the Nile, the African desert and the chain of Atlas. Indeed, every known country except ancient Caledonia, had yielded to her sway. The brave Highlanders, they could not subjugate. Every lake was a Thrasymene, every pass a Thermopylæ.

It is not strange that with this boundless supremacy of the empire, the most lofty pretensions were made by her citizens. To maintain that supremacy, roads were esteemed essentially necessary, and by them was kept up a constant communication with the remotest outposts. They were built at a vast expense, and kept up with unremitting care. We have minute details of the mode of their construction. Generally they were built of pebbles and gravel, or of large and unequally sized stones, something like our flagging, or of regular strata of different materials. Then there was a layer of broken tile or earthern ware set in cement, then a bed of mortar, then an upper coat of

hard material often consisting of large irregular polygons. These were so neatly joined together as to seem almost like one stone.* The width of these roads was usually about fourteen feet. They were elevated above the surface of the adjacent ground, and commanded a view of the country. On each side was a path of large stones, called a margin, intended for foot passengers, and edged with curb stones which kept them from being used by carriages. The line of direction was as straight as possible, rarely deviating even to avoid hills or marshes. Thirty-one of these roads more important than any others, terminated in the city, and their point of union in the forum was marked by the erection of a gilt pillar, called Milliarum Aureum, and placed there by the emperor Augustus. Singular to relate, and in strong confirmation of the Roman historians, this very pillar was discovered in 1823 in

*Some moderns describe with greater particularity the different kinds of roads in use among the Romans. Thus the stratas vias were only pebbles and gravel.

The vias silice stratas, paved with large unequal stones, were a kind of flagged pavement, and the great military roads contained the various strata of material already mentioned. The following technical terms are also given by the road builders to the different parts of the same road : *statumen*, or foundation, *ruderatio*, the tile, *nucleus* the mortar, *summa crusta* the surface.

that very forum. The public roads were called Consular or Pretorian, because constructed under the direction of Consuls and Pretors at the public expense. The private ways were styled agrarian or vicinal. The miles were marked off by stones, numbered from the gates of the city, and in consequence the Latin word lapis, a stone, became synonymous with mile.

From the great roads, others were made leading to unimportant places, to farms and villas. In order to secure the comfort of travellers, seats and stepping stones were placed at short intervals along the route, while taverns called caupones diversoriæ, and post houses called mansiones, or mutationes, were established about five miles apart. At the latter, as many as forty horses were kept at the expense of the government, for the transmission of intelligence, or the accommodation of those travellers who obtained the permission of the proper authorities, in a document called a diploma. In later times, two wheeled chariots called bigas, were maintained on the roads for the same purpose, and ancient paintings are preserved, in which the mode of driving them, and the positions of the passengers are spiritedly represented.

Such was the system prevailing in the management of these highways, that it was an easy matter to travel upon them one hundred miles a day. So late as the time of Theodosius, a magistrate of high rank called Cesarius went post from Antioch to Constantinople with such rapidity that it was made a matter of public record. He began his journey at evening, and reached Cappadocia 165 miles distant the next day. He arrived at Constantinople on the noon of the sixth day, having in that time travelled 665 miles. The influence of a government, which could thus rapidly issue or enforce its mandates, must have been overwhelming.

The supervision of these roads was entrusted to men of the highest rank. Augustus made those about the capitol his particular care, and pretors, attended by lictors, superintended the paving in person. Nor was the Emperor, the first of the Cæsars who did so, for the great Julius acted as an overseer, and in that capacity as the colleague of another noble Roman.

The classics are full of references to this subject. Pliny in one of his epistles to Pontius, speaks of the high satisfaction which he derived from the appointment of his

friend to the surveyorship of the Emilian way. Statius a poet of the time of Nero and Domitian, alludes in his Sylvae to the similar appointment of a friend, in terms of congratulation. Among those of his poems which have come down to us, one upon the Domitian way, a branch of the Appian, contains besides a large portion of flattery of the emperor, a very exact account of the process of road making, and a glowing eulogy of its advantages. The lines in the commencement of the poem describe the first efforts of the laborers in a very animated manner, and allude to the noise they necessarily occasion.

"Quis duri silicis gravis que ferri
Immanus sonus equori propinquam,
Saxosae latus Appiae replevit?"

In the fiftieth line he breaks forth thus:

"O quantae pariter manus laborant,
Hi cedunt nemus, exuuntque montes
Hi ferro scopulos trabesque levant,
Illi saxa ligant opusque texunt,
Cacto pulvere sordido que topho."

These expressions almost exactly describe the modern operation of grading and paving.

Nor is it singular that the Roman government was so successful in its public works, when it interested its citizens directly in their construction, by paying them liberally

for the labor of their slaves, besides creating avenues on which the spoils of conquest were to be returned, for division among the people.

The Appian way, so celebrated as to be styled Regina Viarum Longarum, was called after the name of its constructor, Appius Claudius Coecus. This is not the person whose name has come down to us in connection with that of the hapless Virginia, but a noble Roman, who won the confidence of his countrymen by his patriotism and eloquence, and who lives in the verse of Ovid and the prose of Tully. It was he, who in his old age and in its infirmity of health, dissuaded the people from accepting an inglorious peace with Pyrrhus. Yet illustrious as he was, for the qualities which they most admired, the peaceful honors of the Appian way have outlasted all the rest. This work is the reflector, which has shed the light of his memory and example through the long vista of years.

The road was constructed several hundred years before the Christian era, if we may judge from corresponding events, and ran from the Porta Capena, now the modern gate of St. Sebastian, to Capua a distance of

about 130 miles, then the limit of the Roman territory. It was afterwards continued as far as Brundusium; and to Julius Cæsar this extension is generally attributed. Its whole length was about 342 miles. It was paved with the hardest flint, and the whole distance was marked out by small columns, at a mile's distance from each other, called termini. At Sinuessa, a maritime town of Campania, celebrated for its thermal springs and mineral waters, it branched off into the Domitian way, and led to Baiæ, Neapolis and Pompeii, at which latter place, it has been brought to light and become the property of modern research. The Appian way crossed the Pontine marshes, and necessarily required the greatest attention and frequent repairs. In the year before Christ, 158, it was very extensively repaired. A stone in the tower of Triponti, still records the fact that the emperor Trajan expended money for a similar purpose; and as late as the time of Pius VI. the road was kept in excellent condition throughout the papal territories. The exhumation of Pompeii and Herculaneum, after a thousand years interment beneath the the lava of Vesuvius, has exposed to modern curiosity a perfect picture of an-

cient life and manners. New light has been thrown upon arts long since forgotten, and even the subject now under discussion has been benefitted by the discovery.

Let the reader says a modern writer, who has furnished us with the most graphic description of Pompeii, suppose himself passing this road, then as he approaches the city, both sides of the way for nearly a furlong before he reaches it, are occupied by tombs and public monuments, according to the Roman custom, intermixed with shops in front of which were arcades. The chariot way is narrow, seldom exceeding ten feet in width, except within the gate at the commencement of the great street where it is upwards of twenty feet across. The footways are two or three feet wide, and elevated from eight inches to a foot above the road having a curb and guard stones. The traveller passing through the street of tombs enters the city by the gate of Herculaneum. Here a long tortuous street presents itself to his view, having on either side broken walls of lava stuccoed and decorated with arabesques and paintings mingled with the peculiar letters then in use. The streets are paved with large irregular pieces of lava

joined neatly together, in which the chariot wheels have worn ruts still plainly discernible. In some places they are an inch and a half deep, and in the narrow streets follow one track. Where the streets are wider, the ruts are numerous, and irregular. In those places where numerous pieces of lava met in one point, and in process of time a hole was made, the injury was repaired with pieces of ,iron which still remain in the angles. In most places the streets were so narrow that they might be crossed with one stride, where they were wider, a raised stone was placed in the centre of the crossing place. The Flaminian way was another of these famous roads, constructed by the consul Flaminius who was killed at the battle of Thrasymene. It extended to Arimenum a city of Umbria, at the mouth of the Arimenus, 180 miles from Rome. The gate of modern Rome opening upon this road is the Porta del Populo, though not occupying precisely the site of the old gate. This was the great route along the Adriatic. Where it crossed the river Nar about sixty miles from Rome, there was a bridge with an arch of 150 feet span, and 100 rise, which was pronounced by Addison the stateliest ruin in Italy.

Besides these, the other principal roads were the Aurelian leading along the Mediterranean from Rome to Nice. The Claudian which branched from the Flaminian at the Pons Mulvius, now the Ponte Molle, celebrated as the scene of the death of the tyrant Maxentius. Thence it reached and united with the Aurelian at Lucca. The Emilian led from Placentia to Ariminum, the modern Rimini. The Valerian, passed through the Sabine territory to the German colony of the Marsi, who for a long time resisted the Roman arms. On this was situated the celebrated villa of Mæcenas. The Latinian was a road of sixteen miles in length leading to Mount Albanus, where those singular consular sacrifices, called the Feriæ Latinæ took place, and the triumphant generals sometimes led their armies in solemn procession. The Cassian way, which went from Rome to Florence, is still the principal route across the Campagna. The Salarian was another avenue into the Sabine country by means of which the citizens received their supplies of salt. Another road was the Ardetina, a branch of the Appian, and it led to the town of Ardea, near the coast; another the Labicana, and

Prenestina, which ran to Preneste, a town in Latium twenty-one miles from Rome, celebrated for its oracle and temple. Another was the Nomentana, leading to a Sabine town of the same name, whence the luxurious derived much of their wine. It was to the Sacred Mount, visible from this road, that the people of Rome withdrew, when they revolted against the Patricians, and from which they returned when admonished by the well composed fable of Menenius Agrippa. Besides these, were the Tusculan or Campanian way, leading out of the modern gate of St. John's to Tusculum, and the Ostian which connected the city with the port at the mouth of the Tiber, sixteen miles distant. This is now a place for the banishment of criminals, but in consequence of the changes effected by the river and the sea, it is no longer a maritime place.

All these roads were more or less adorned with tombs and monuments, long since despoiled either by barbarian conquerors, or relentless antiquarians. The description already given of the street of Tombs in Pompeii, is supposed to be generally applicable to all the principal urban roads of Italy. The tombs of the dead, mingled with the gay re-

sidences of the living. Monuments, porticos, seats and statues, blended life and death so closely, it seemed as if the spirits of the old Romans after the termination of their corporeal existence, returned to mingle in the busy throngs they had left behind.

We have already noticed the custom of having post horses on the great roads, and that carriages were subsequently introduced. These were after the Greek model. The Roman ladies were much accustomed to sedan chairs, the curtains of which were of skin or cloth, and the windows of mica. They reclined on pillows, and were carried about by their slaves. There were also litters drawn by mules. When horses were driven before chariots, they were harnessed abreast of each other, and Nero who vaunted of his talents as a fiddler, boasted also of having driven ten horses side by side at the Olympic games. Sleds, or carriages without wheels were generally used in rustic life.

Sometimes four wheeled carriages were employed to carry females to the public exhibitions, and were called pilentæ, but these were not in ordinary use. Those built for speed had but two wheels, and were called Citia.

It would be entirely useless to extend this portion of our discussion. Those desirous of studying the details of Roman travelling, will refer to those classic writers familiar to every student. Almost all modern travellers in Italy give some account of the ancient roads, and volumes might yet be, as volumes have been written on this feature of Roman enterprise.

The grandeur of the empire, and the vastness of its influence have furnished themes for the ablest historic pens, and nothing is more certain than the fact, that what the valor of the Romans won in the field, their sagacity retained for them by the construction of roads.

Even now one of the first fruits of the French conquest in Africa, is the discovery of a Roman military road, which the conquerors intend to turn to their own advantage, and as the means of making a new sea port for Constantina instead of Bona, which has hitherto been used as such.

The translation of the Roman power to the banks of the Bosphorus, led naturally to the abandonment of the public works of which we have treated. Political considerations involve too often all other interests.

It is in vain that industry or patriotism exert their influence against misgovernment. Misgovernment brings all to ruin, and Imperial Rome, drawing her supplies from a subjugated world, could not at last repair the prodigal waste of even the few who controlled her destinies.

The contrast between her days of magnificence and her decline is beautifully painted by a modern writer.

> The sea is white with sails
> Innumerable, wafting to the shore
> Treasures untold; the vale, the promontories
> A dream of glory. Temples, palaces
> Called up as by enchantment, aqueducts
> Among the groves and glades rolling along,
> Rivers on many an arch high over head;
> And in the centre, like a burning sun,
> The Imperial City.
>
> * * * * * * * *
>
> Once more we look, and all is still as night;
> All desolate. Groves, temples, palaces,
> Swept from the sight, and nothing visible
> Amid the sulphureous vapors that exhale,
> As from a land accurst, save here and there
> An empty tomb, a fragment like the limb
> Of some dismembered giant. In the midst
> A city stands, her domes and turrets crowned
> With many a cross; but they that issue forth

Wander like strangers who had built among
The mighty ruins, silent, spiritless:
And on the road, where once we might have met
Cæsar and Cato, and men more than kings,
We meet, none else, the pilgrim and the beggar.

CHAPTER II.

When the seat of empire was transferred from the Tiber to the Bosphorus, the power and resources of the imperial city declined, and her roads, bridges and aqueducts went to decay. These monuments of her greatness fell beneath the hand of time and the ruthlessness of invasion; and though they had indirectly favored the propagation of Christianity, and the historians of the church admit the facilities of communication afforded by them, they were suffered to remain unrepaired, and the distant provinces, and the remote population that had felt the energies of the great central power, were now left to their own resources, and their own opinions.

Darkness gradually overspread the world, and for a time, covered with its gloomy pall the literature, the arts, and the trophies of former ages. The human intellect, although visited by the day-spring from on high, withdrew from the consideration of the true objects and responsibilities of life, to lose itself in dreamy abstractions, and gave up the

realities of existence for a philosophy of shadowless images. The natural repugnance of the Christians of those days to the works of heathen art, which is supposed by some to have hastened their decay, was not a little aided by a decree of the Council of Carthage, which in the year 398, prohibited the reading of secular books by the clergy. Physical science could not prosper in such a state of things, and a "jargon of mystical philosophy half fanaticism and half imposture, a barren and inflated philology," if we may credit the historians of that day, characterized this period. After the introduction of monkery, says Hallam, and its unsocial theory of duties, the serious and reflecting part of mankind on whom science mostly relies, was turned to habits which, in the most favorable view, could not quicken the intellectual energies.

The final settlement of barbarous nations in Gaul, Spain and Italy, consummated the ruin of those arts by which Rome had become the mistress of the world.

One of the legacies which she had left to her distant provinces was her roads. The island of Britain had her share, and their position is well known to antiquarians. Indeed

there is a book extant, called the *Iter Brittanicum*, attributed to the Emperor Antinous, which is an itinerary, containing the names and direction of the roads in that island. It was this emperor who distinguished himself as a restorer of the public works, and the rebuilder of public edifices; and who declared that he preferred the preservation of one citizen to the death of a hundred enemies. These British roads served principally as a means of communication between the military posts. It is the generally received opinion among the antiquarians, that the southern part of the island was crossed in various places by four great roads, and these are well known and particularly described, as the Fosse, Watling St., Ermine St., and the Ikenild.

The Fosse commenced at Totness, in Devonshire, and ran to Bristol, Cirencester, Coventry, Leicester, Newark and Lincoln.

Watling St. commenced at Dover and proceeded through Kent by the way of Canterbury to London; thence northwardly to Edgeware, St. Albans, Dunstable, Stony Stratford, and along the western boundary of Leicestershire; it crossed the Fosse near Bosworth, and terminated at York and Ches-

ter le Street in Durham. Some persons imagine that it was subsequently continued to Caithness in Scotland.

The Ermine St., ran from St. Davids, Wales, to Southampton, crossing the Fosse in its way.

The Ikenild is supposed to have commenced on the eastern coast of England, then to have crossed Watling St. at Dunstable, and to have proceeded thence northwardly through Staffordshire to the west coast.*

The remains of old Roman roads are now frequently discovered in England, and it is a singular fact and worthy of notice, that Sir Christopher Wren, when preparing to erect the church of St. Mary-le-bone, found one of these causeways eighteen feet below the surface of the ground; and so exceedingly firm was its texture, and so firmly cemented its material, that he actually erected the tower of the church upon it, as the best foundation he could possibly obtain.

These roads were constantly traversed by the military, who had their stations erected

* In the United Service Journal for January, 1836, is an account of a recent survey of a Roman road from Silchester, made by some officers of the Royal Military College.

at proper distances, to preserve their supplies. Some of these points became marts of trade, and it is conceded by the early historians of England, that these works of the Romans materially benefitted their country, and gave an impetus to the national industry.

France, then Gaul, was also traversed in every quarter by these military roads, which are fully treated of in the French Encyclopedia. One of them crossed the mountains of Auverne, and reached Aquitaine; another followed the Meuse to the German ocean; another went through Burgundy, Champagne, and Picardy to Boulogne; another extended along the Rhone and stopped at Marseilles. All these were connected, by numerous branch roads, and their ruins are still discernible to the eye of the traveller.

The departure of the Romans from these countries, was the signal for intestine commotions, and bloody invasions by foreign enemies hitherto held in check by the terror of the Roman name. They had in consequence neither time nor ability to keep up the communications which had for several hundred years been established by their conquerors. It would be a tedious task to fol-

low the ancient Britons through their succeeding history. The sway of their Druid priests, and the ignorance in which they kept the people, tended as much to the downfall of the nation, as the hundred years of war, which ended in their complete subjugation. It is not strange that their roads, their walls and their towns almost ceased to exist. Imagine, for a moment that such a series of misfortunes as these were the lot of our own country, and where would the future historian find the monuments of our greatness. If one disastrous fire effaces a large portion of the most valuable quarter of a city within our own observation and in our brief day, what must be the effect of a century of bloodshed and conflagration? Britain, says the eloquent Gibbon, was for a time lost among the fabulous islands of the ocean.

It is ascertained with considerable certainty, that previous to the conquest by the Romans, the natives had trackways, called in their language, post-ways and ridge-ways. They were neither paved nor faced with gravel, but were covered with turf. Narrow roads were called passes, and in order to render them secure to travellers, the woods which skirted them were cut down. The

Romans are said to have adopted some of these routes.

A discussion has prevailed to some extent as to the fact whether at this period any other mode of transportation was adopted, than that of pack-horses; but the best authorities are strenuous in the affirmative. The internal trade of the country, as may be imagined, was very trifling for many hundred years, although local regulations were made to encourage it, such as the establishment of weekly markets and mints in the principal towns. It is a remarkable circumstance that the most important part of the trade consisted in the sale of slaves taken in their domestic wars. The nearest relatives did not hesitate when they had the opportunity, to sell each other into captivity, and slave merchants visited England as late as the time of the Roman conquest, to purchase its sons and daughters for the Spanish and African mart, for those of Italy, and still nearer home, for those also of Ireland.

The slave trade of our own time is not more cruel in its character, nor is it conducted with greater energy, than that was to which we refer. William of Malmsbury says, it was a custom which seemed to be

natural to the people, and the biographer of a pious prelate of that time, speaks of the horrors and iniquities of the traffic with such warmth, as to call forth the indignation of every honest breast. The sale of some very fine looking young men in the city of Rome, gave Gregory the Great the first idea of sending missionaries to their native country.

In 1285, and not till then, did the subject of roads become sufficiently important to attract the attention of the government, when the first act was passed in relation to them.

In 1346, Edward the third was empowered to levy a toll on carts or carriages going from St. Giles in the field to Temple bar. In the time of Henry VIII. an attempt was made to procure the improvement of the roads, by compelling the parishes through which they passed to keep them in repair by rates levied on land-holders, and labor enforced on others. An essential improvement also took place in the reign of Philip and Mary, when the annual appointment of road surveyors was authorised to be made by the inhabitants. Some further alterations were then made to the existing laws, by Mary and Elizabeth, and in the time of James I., and Charles I. and II. the system of toll-gates was adopted

in consequence of the increase of travel, which injured the roads without furnishing the necessary means of repair. The first toll was exacted in the reign of Charles II. upon persons travelling on the great northern road. This for a time proved to be an unpopular measure. The people rose and pulled down the gates, and an armed force was ordered out to maintain the law. The landholders remonstrated against tolls, because in their opinion they reduced the value of their property;—a notion which experience soon corrected. But though the owners of the soil saw their error, yet as late as the reign of George II,. it was necessary to prevent the pulling down of toll bars by declaring it to be a felony. A multitude of enactments followed from time to time, but it was not till after 1760 that turnpikes became general. Between that year and 1774 452 turnpike acts were passed, and between 1785 and 1809 no less than 1062 more. The details of the system by which they are managed, are fully given by numerous writers on the subject, and copious extracts are given in the latter part of this treatise. Parnell, Dupin, Edgeworth and McCulloch, are parti-

cularly worthy of the study of those who would thoroughly understand the legislative history of roads in England. Notwithstanding all that had been done, down to the middle of the last century they were almost impassable for wheel carriages. As these have been modified from the original forms into their present elegant and convenient shape, by the progress of refinement and the improvement of the public roads, a glance at their progress may not be uninteresting. Some authorities contend, that for many hundred years after the departure of the Romans, nothing but pack horses were used for the conveyance of goods, and that wheel carriages were unknown. This is not so. A particular account of no less than six different kinds of vehicles is preserved—The Benna, Petoritum, Currus, Covinus, Essedum, and Rheda. The Benna was used by travellers, and the Currus was the common waggon of the country, appropriated to agricultural and mercantile purposes. The others were chiefly of a military character. The Essedum is mentioned in Cæsar's Commentaries, and its peculiar form was adapted to the mode of fighting then habitual with the Britons. An animated description of an

ancient war chariot is to be found in Ossian, in which he styles it "the flame of death."

Besides the usual method of travelling on horseback, litters were also in vogue. Subsequently the queens of the different small kingdoms into which England was for a time divided, enjoyed the exclusive privilege of the car or chariot, and one of them is said to have hung up in a bag, with her most esteemed relics, that in which she occasionally rode. These machines must have been very rude of construction however, when the greatest improvement made on them by the Saxons is said to have been the substitution of a hammock swung between four posts mounted on wheels upon which the passenger reclined. In some of the earliest specimens of English poetry we find mention made of the *chare*, or charat then in use. There are accounts of coaches as early as 1253, and it is recorded that in 1380, when the celebrated Wat Tyler rose against the crown, Richard II. fled from the tower in a covered carriage called a whirlicote. Queen Catharine, one of the unhappy wives of Henry VIII., was carried to the coronation in a litter, followed by her ladies in *covered chariots*.

The general introduction of coaches into England is attributed to queen Elizabeth, who patronized a German or Hollander, by the name of Boonen, a coach builder from the continent. For the honor of the invention there are as many national claims preferred as there were for the birth place of Homer. With a singular sort of favor, this princess not only bought his coaches but made him her coachman, and the appearance of her equipage thus driven, was thought worthy of being preserved by an engraving. It was first used by her when she went to St. Paul's to return thanks for the destruction of the Armada. From the extreme of scarcity, these vehicles became so numerous as to become nuisances. In 1636, no less than 6000 of them, it is said, jolted about the streets of London. The satirists of the time inveighed loudly against them, and Taylor, the water poet, in particular, complained of the withdrawal of so many persons from their former employment to become through the witchcraft of the coach, "butterfly pages, trolling footmen, and hard drinking coachmen." Although it was for a long time considered effeminate in men to ride about in coaches, yet it seems to have been

a matter of some importance in the then fashionable world, to see who could drive the greatest number of horses before them. It is gravely chronicled that in 1619 when the Duke of Buckingham had driven six horses in hand, he was outdone by a nobleman who proceeded through the streets of London with eight. The surprise of the citizens at this feat of daring, added to his celebrity, although it was already that of "the Percy's high born race."

Down to the time of James I. the judges rode to court on horseback, and the Lord Mayor who now rejoices in his coach and barge, was also obliged to play the equestrian, but with a vaulting ambition that often over leaped itself and fell on the other side.

Sir Walter Scott who drew many of his most pleasing descriptions from facts which lay in tradition, or lived chiefly in domestic history, has given an account of a coach in the time of Charles II., which is to be found in his admirable novel of "Old Mortality."

The Lord Lieutenant of the county, says he, a personage of ducal rank, alone pretended to the magnificence of a wheel car-

riage, others covered with tarnished gilding and sculpture, in shape like the vulgar picture of Noah's ark, drawn by eight long tailed Flanders mares, carrying eight insides and six outsides. The insides were their graces in person, two maids of honor, two children, a chaplain stuffed into a sort of lateral recess, formed by a projection at the door of the vehicle, and called from its appearance the boot, and an equerry to his grace ensconced in a corresponding contrivance on the opposite side. A coachman and three postillions who wore short swords, and tie wigs with three tails, having blunderbusses slung behind them and pistols at the saddle bow, conducted the equipage. On the foot board behind this moving mansion house, stood or rather hung in triple pile, six lacquies in rich liveries armed up to the teeth."

As further illustrations of the manners of a nation whose progressive importance has been so dependent on roads, the various vehicles used on state occasions would furnish an amusing picture. Were we to pursue all the by-paths which lead from our main subject, it would be impracticable to confine ourselves within the limits to which we are prescribed.

It seems that coaches were only first let

to *hire* as late as 1625, and that the practice originated with an old naval captain of the name of Baily; and the next year a follower of the Duke of Buckingham obtained from Charles II. the privilege of keeping Sedan chairs. A valuable chapter of statistics might be furnished on this topic as well as the preceding. Connected with the improvement of the roads was that of stage coaches, which as a public benefit, have from time to time attracted the public attention. Their speed gradually increased as the roads became better. For example, the first that ran between Edinburgh and Glasgow, in the year 1678, a distance of forty-four miles occupied six days in going and returning: now the journey is performed in four hours.

In 1706 the stage coaches went from London to York in four days, and now they perform the distance in twenty-four hours. In 1712 it took thirteen days to travel by coach from London to Edinburgh, and now it requires but forty hours! In 1760 travellers were two whole days in going from London to Brighton, now they are only about five hours. One of the greatest triumphs of modern times is that of rapid and safe traveling. The difficulties formerly attending it

are alluded to constantly by the writers of those days. Leaving out of the account, the dangers which arose from the frequency of thefts, murder and highway robbery, which according to Hallam, became almost the national crime of England during the middle ages, we find that the bad condition of the roads had a serious effect on the national prosperity, and on individual comfort. Having illustrated by a quotation from Scott, the character of a coach in the time of one of the Stuarts, it may be well to introduce the description of a journey made by some illustrious personages, as late as the time of queen Anne. When a royal visiter from Spain attempted to pay a visit to Prince George of Denmark her husband, he found its accomplishment almost impossible. "We set out, says the narrator of the expedition, at six in the morning by torch-light, to go to Petworth, and did not get out of the coaches, only, when we were *overturned* or stuck fast in the mire! His highness's body coach would have suffered very much if the nimble boors of Sussex had not frequently poised or supported it with their shoulders, from Godalming almost to Petworth. The last nine miles of the way cost us six hours to conquer them, and indeed we had never

done it, if the king had not several times lent us a pair of his horses out of his own coach."

It seems this Petworth road was no better a long time afterwards, for when a Duke of Somerset proposed to travel upon it at a certain day, a letter was sent in advance directing the keepers and persons who knew the holes and sloughs "to come to meet him with lanterns and long poles to keep him on his way." The Sussex roads then bad to a proverb, are now famous for their excellence.

In 1739 two persons undertook a journey from Glasgow to London on horseback, and they found nothing but narrow causeways until they came within 110 miles of the metropolis.

They encountered strings of pack horses thirty and forty at a time, carrying goods, the leader of the train being equipped with a bell to warn travellers coming in an opposite direction and these were generally obliged to draw on one side into the ditches so that the train could pass.

We have noticed the various characters of the roads and of the vehicles used upon

them, at different periods of time. The accommodations furnished by the way side require a passing notice. Industrious antiquarians have not failed to trace out all their peculiarities. At first, private dwellings were used for lodging places and houses of refreshment. Religious establishments were also compelled to entertain travellers if their hospitality was demanded. In the first part of Shakspeare's play of Henry IV. the first scene of the second act is laid in an inn-yard at Rochester, where in the brief dialogue between two carriers, many of the characteristics of the inland traffic of the time are given with graphic skill. In the opening chapter of Kenilworth, the modern Shakspeare, has given an equally vivid description of the host, the fare and the guests which were to be found in the time of Elizabeth congregated under the roof of such as Silas Gosling of the Bonny Black Bear.

From the specimens thus far given of the roads with their concomitants in England during the middle ages, we may judge very accurately of the state of them on the continent. Ex uno disce omnes. From the past we now turn to the present time. Let us now examine their present condition through-

out Europe, before we pass to the important considerations connected with recent discoveries in the form and management of roads. The roads of England and Wales are now computed to be upwards of 24,000 miles in length so far as they are turnpiked. And the extent of the common and private roads in the United Kingdom is estimated at 100,000 miles. The public roads are of the finest description, being constructed on scientific principles, and designed by eminent engineers The plan of construction, so far as material is concerned, is generally that of Mr. McAdam, although the notions of Mr. Telford as to the necessity of having a non elastic foundation seem now to prevail among the English engineers.

Great care is taken to leave a perfect drainage by means of deep ditches communicating with the streams and natural outlets of the country. These it is held, should be sunk at least three feet below the surface of the road, and wherever the water is likely to lie on the surface from the nature of the slopes, or route, cross chains are always provided.

The cuttings through hills are carefully made not merely for the purpose of keeping

the banks in their places, but to allow the wind and sun to have the greatest effect and therefore a slope of two feet horizontal to one perpendicular is strongly recommended.

It is also usual to protect these slopes by covering them with sods. No improvement says a writer on this subject, will be found greater than keeping the surfaces of the roads above the level of the adjacent land. A convex surface seems to be the most in use, though there are strong objections to it, and the idea does not generally prevail. The materials for a good road are various. Greenstone, granite, sandstone, and limestone are all adopted according to circumstances. A mass of valuable information on this head, has from time to time been elicited in the examinations made by committees of the House of Commons, of competent engineers, and by the various experiments undertaken to ascertain the best arrangement of the material. A dry foundation and layers of clean hard broken stone appear to be the chief object of the English road makers. They state that all those imperfectly formed with pebbles or gravel, on a loose foundation, soon wear out, for the reason that they

expand readily with heat, and throw up the stones, or else absorb moisture, and loosen them. In short that the consequent wear and tear of the material lead to the destruction of the road and a constant outlay to keep them in proper order. All kinds of pavements have also been proposed in reference to this subject. Patent after patent has been taken out for the purpose of securing some supposed advantage.

As one of the natural consequences of the formation of roads, pavements became necessary, particularly in cities, where the convenience of a dense population requires that the public avenues should be kept in a passable condition, and also on those routes where the transportation of goods with the least practicable difficulty became a matter of importance to purchasers and consumers.

It is a singular fact however, as has already been incidentally seen, that the highways of the ancients were much oftener paved than the streets of their cities.

According to Isidorus, Carthage was the first town in which pavements were introduced, and her example was followed by her subsequent rival Rome. The exact time at which the latter adopted this improventis

still in doubt, and it has been a grave matter of inquiry not fully decided by the antiquarian critics. A passage in Livy is as yet uninterpreted in relation to this subject, although that historian speaks explicitly in other places of the pavement in the vicinity of the ox market, the Temple of Venus, and the Temple of Mars.

The city of Jerusalem has been supposed to have been paved from some circumstances in its history, and from a proposition mentioned by Josephus, as having been made by the Jews to Agrippa, which was to employ the workmen for that object, after they had completed the rebuilding of the temple.

All writers agree that of the modern cities Cordova in Spain, was the first which was paved, and that it was so improved in the year 850 by the Caliph Abdorrahman. One of the proofs that this prince was an enlightened man, is the fact that he favored trade, improved its avenues, and supplied his capital with water in leaden pipes.

The city of Paris was not paved even in part until the twelfth century, and as late as 1614 many principal streets were still in their original state. Even now they are not

in as perfect condition as the refinement of the age, and the comfort of pedestrians require. Other large French towns followed the example of the metropolis, and it is asserted by historians of that country, that after the system of pavements became general many dangerous maladies almost entirely disappeared. London was not paved until the end of the eleventh century, and then only in part. As the wealth of the city increased, these improvements were extended, and favored by different monarchs. Berlin was first paved in 1679, and other continental towns progressively adopted the system. The regulations of the police which followed its adoption in different countries, though in many respects curious, are not sufficiently important to justify their introduction into this treatise.

To practical readers it may however, be interesting to glance at the different kinds of pavements now in use. Some of the cities of Italy afford fine examples of the art. The tracks for wheel carriages are composed of large blocks of limestone or sandstone, some of them at Florence weigh several tons. The streets of Naples are laid with immense rectangular pieces of basalt at

least six inches thick, laid in cement, forming a solid and smooth surface. Those of modern Rome are also paved with basaltic cubes set in mortar, each furnishing a surface of ten inches square.

In Russia, blocks of wood have been used, and successfully for the same object, and a similar experiment has been made in the city of New-York which thus far has been satisfactory.

There are no less than twenty-one kinds of paving used in England, well known to scientific road makers in that country.* One of the most celebrated is the Leith walk of Edinburgh formed of ashler.

In street paving at the present day, the following rules are adopted as being the result of study and experience.

All small based, or wedged shaped stones must be rejected, and all clayey particles in the stratum on which the stones are to be bedded, should be removed. The bed of the road should be well hardened by ramming and treading. An uniform elevation of the paving stones should be carefully studied, and also as great an uniformity in size. Single corners of broad or large stone should

* See Appendix.

never be laid across a street, as they form a belt which does great injury to carriages when passing over it. On the same principle, any courses of small stones laid in the same way, sink down and form a trench equally destructive. The pavement when laid down, should also be well rammed down. The object is smoothness, stability and imperviousness to water, and as these are gained, the excellence of the pavement is established.

One of the most recent improvements, if such it may yet be considered, is the introduction of a composition of asphaltum, which is poured hot from a cauldron upon the stratum of earth, previously prepared for it, and becomes hard and impermeable. Enough is not yet known of its durability to justify any opinion as to the probability of its coming into general use.

Besides the various processes recommended for the formation of roads, there are many for keeping them clean and in repair, and while the loss of material from wear and tear is obvious to the eye, calculations have been made with great accuracy, to ascertain what loss is sustained by carriages used

upon them and what is the comparative ease of draught upon various kinds of roads.

The draught of a waggon weighing 21 cwt. on a well made pavement as indicated in a newly invented dynamometer of Mr. McNeil, is 33lbs. or in other words, the force used to draw the waggon over that portion of road is 33lbs; over a broken stone surface of flint, 65lbs; over a gravel road, 147lbs.; over a broken stone road on a rough pavement foundation, 46lbs.; over a broken stone surface upon a bottom of concrete, 46lbs.

The English turnpike roads are under the care of trustees appointed by act of parliament, who are authorized to borrow money for their construction or repair, on a mortgage security of the tolls. These tolls are sometimes put up to be sold by auction, and some of the single gates about London have brought under the hammer, as large a sum as $15,000 a year. In 1829 the turnpike debt was over 27 millions of dollars. The annual expenditure for repairs was above 7 millions and a half of dollars. The income was about 6 millions of dollars. The chief objection to the trustee system of supervision, is that the trustees are often too

numerous and do not always act in concert, These appoint surveyors who manage the details. The common roads are still worked by the inhabitants of the parish, who appoint their surveyors, as in early times. The best road in England is said to be that from London to Holyhead, although crossing the most rough and mountainous places in Wales, and it has been made the special subject of parliamentary inquiry. In the constant reports and examinations annually made in the British Commons on the internal improvements of the empire, the most interesting facts are continually developed. The effect of the construction of new roads has thus been found to be beneficial beyond all expectation. The face of the country in certain districts of Ireland has been completely changed within a few years, by similar improvements. New villages have sprung up, and the inhabitants have found out that industry and enterprize are preferable to discomfort and idleness.

Mr. Telford on a similar occasion bore witness to similar changes effected in Scotland. "I consider" said he, "these improvements some of the greatest blessings ever conferred on any country. £200,000 ex-

pended in fifteen years has changed the moral habits of the great working class for the better, and has advanced the country at least one hundred years."

At the risk of trespassing upon the patience of our readers we cannot omit this opportunity of paying a humble tribute to the memory of Mr. Telford.

This extraordinary man was an example of the triumph of genius over the usual difficulties of life. It is somewhat singular, that the most eminent practical engineers have been those who were destitute of what is termed a classical education. Like Brindley, he was destitute of collegiate honors. The son of a humble mechanic of Dumfries in Scotland, he commenced his career in the work shop of a stone mason, and during the leisure he could snatch from the hours of repose, he might have been seen sitting in the kitchen of a humble cottage, reading his favorite books by the glimmering light of a turf fire. At this time his skill as a workman, and his taste for poetry were remarked by his acquaintances, and as soon as his apprenticeship expired, he repaired to Edinburgh, to prosecute with unremitting diligence, the science of architecture. In 1782,

at which time he was 25 years of age, he went to London under the patronage of Sir William Pulteney, a native of his own parish, and a personage whose name is well known in this state.

His talents there found a field worthy of their exertion, and after superintending some public works, highly to the satisfaction of his employers, the government, he received a valuable appointment as a mark of its favor, which he retained to the time of his death.

From this time his fame was established. He was consulted by the engineers of other nations, and astonished his own countrymen by the vastness of his designs, and the perfect accuracy of their execution. His most admired works are the road from London to Holyhead, and its celebrated bridge over the straits of Menai, connecting the island of Anglesea with the Welch coast. This was erected on the principle of suspension, and exceeded in magnitude any similar work in the known world. Under it passed without inconvenience the "masts of the tallest frigates." When we consider the immense weight of iron, more than 2000 tons which had to be suspended in order to

sustain the roadway, and the frightful elevation at which the work was executed, we may well believe what the projector often declared, that it cost him more intense thought than any other he had ever undertaken.

The Caledonian canal was another of the monuments of his talent. So were the St. Catharine docks, the Highland roads and bridges, the canals of Salop, numerous acqueducts, and the internal water communications of Sweden, connecting the Baltic and the North sea. Indeed nothing of any moment was attempted, having reference to the public works of his own country, without his advice or co-operation.

It is pleasing to think that with all this flush of popularity, and this eminence of reputation, he preserved his natural simplicity of character, and was not less esteemed for his private worth than his public services.

During the constant pressure of business, he found time to teach himself the Latin, French and German languages, and to become an accomplished algebraist.

Having known from experience the melancholy truth, "slow rises worth by poverty depressed," although he himself had boldly

soared above its influence, by the unconquerable energy of his own mental resources, he became the well known patron of indigent merit, and was the means of raising many excellent individuals to well deserved distinction. He died in 1834 at his residence in Westminster, and his remains were honored with a resting place in the Abbey.

Who can reflect on the useful career of such a man, without giving it a decided preference over those empty and deceptive pursuits, which minister solely to ambition without giving any real claim to the respect and admiration of mankind. And what young man need be discouraged at his onset in life, if he has within him, the determination to succeed, and the consciousness of unyielding integrity. Thus armed, he may bid defiance to difficulties, overcome "the proud man's scorn, the rich man's contumely," and rise to the station in life for which his talents have rendered him worthy. If the heart of a single person who reads this should haply be nerved to new exertions by the hasty sketch of a great and a good man, we will not regret the moments we have snatched from the main subject for this brief digression.

The roads in Scotland are now highly spoken of. They are said to have improved much more rapidly than those of England. They are managed by local trustees, or government commissioners, are made either at private or the public expense, and sometimes both. In the time of Cromwell, his well known partizan General Wade, by means of his soldiery, commenced two celebrated roads into the Highlands from Crief in Perthshire, an important pass. They were 250 miles in extent and were finally completed in 1737. They ran, however, over such a rugged and difficult country as to be continually out of repair, and the people were too poor to keep them in order. These early military roads extended no further north than the Moray frith and along the Caledonian glen.

The wide and extensive country beyond, intersected by arms of the sea, mountain streams and innumerable ravines, was almost without any means of intercourse. A very striking proof of this is found in the fact that the counties of Caithness and Sutherland were not required to return jurors to the northern circuit at Inverness. Thus were civilization and the administra-

tion of justice retarded by the neglect of internal improvements, a circumstance too often forgotten by those who are opposed to their progress. This state of things attracted the attention of the British parliament, which resolved to extend the benefits of the road system through every part of the Highlands. In 1803 the commissioners appointed under an act of the national legislature commenced operations, and in the words of a writer connected with the superintendence of the commission, "a change was effected in the state of the Highlands perhaps unparalleled in the same space of time in the history of any country."

The expense was met by legislative appropriations and local contributions. Upwards of 875 miles of road and 1117 bridges were the result of this effort of the government. Mr. Telford, the engineer under whose masterly direction the work was conducted, gained much of his reputation by the scientific arrangement of his grades and his thorough system of draining. Some of the consequences of this splendid scheme of internal improvement may be briefly stated, and they hold out to the sceptical and the ignorant, the best possible proofs of the advantage and propriety of similar projects elsewhere.

It was not till 1806 that stage coaches were regularly established in the Highlands, and the former absolute solitude of her romantic glens is now enlivened by the presence of hundreds and thousands of delighted travellers; and everywhere, commodious houses of entertainment have been erected, and the facilities of intercourse enlarged. The effects upon the agriculture and internal trade of the country have gone hand in hand with these facilities of intercommunication. Large crops of wheat are raised in places formerly untilled. Droves of cattle, neat habitations, and cheerful farmhouses now meet the eye, where once was all a waste. The value of land in the north has risen beyond all expectation. The estates of Chisholm, (only one instance out of many) have risen in value since 1785, from $3,500 to $25,000 per annum.

Besides these national roads, there are others made by districts, and statute labor, which have latterly greatly increased. The labor may be commuted for in money. The Scottish highways which are not turnpiked are managed by boards of magistrates, consisting of justices of the counties convened annually, who appoint the subordinate offi-

cers and decide all questions connected with the subject. The defects of this system however, are sufficient to have induced most of the counties to obtain acts of parliament appointing trustees, and investing them with the sole authority of construction and management.

The periodical reports of the commissioners for these Scottish roads, are among the most interesting documents of their kind, and afford conclusive evidence of the utility of roads even when constructed in the most unpromising localities. These reports and others of a similar character have for many years been made the subject of parliamentary examination, and the mass of information promulgated by this means has led to the most important results. As an evidence of the minuteness and character of these investigations, it is worthy of notice that the commission of 1808 undertook to ascertain the best form of wheels to favor the draught of horses, and preserve the roads from injury. Civil engineers, postmasters, stage coach proprietors, coach makers, cartwrights were all examined on the points most familiar to themselves. In 1819 a general report was made by a committee

of the House of Commons, containing the most important facts, and confirming the advantages of the new system of construction over the old.

The roads of France are generally straight, but have been constructed with little reference to grade. Their breadth varies from thirty to seventy feet, the middle portion is generally paved with stones six, eight, or ten inches square, the foundation having first been prepared and drained. Some are built of rubble stone upon a plan adopted by Turgot previous to the revolution. The cross roads are scarcely anything but narrow lanes shaded with shrubbery; and most of the second class roads are badly paved, or merely covered with gravel. They are almost impassable during some part of the year. On either side of the road a space is generally left unpaved, and long formal rows of trees comprise the vista. The department of bridges and roads has the direction of construction and repair, and sums are voted by the Chambers to be expended under their supervision. In 1830 the expenditure for repairs amounted to nine million of dollars. In 1828 the royal roads extended a distance of 8631 leagues, and

the departmental at 7704, while in that year the expenditure on the royal roads alone were upwards of twenty millions of dollars. Previous to the revolution, the old system of the Corvee remained in force, which was the obligation of the inhabitants to work upon the roads or pay a certain amount of money for the same object. It was the subject of so much complaint as to have been abolished at that period. Sir Henry Parnell in his recent treatise, says that after all the efforts of the French statesmen, the system of management is still imperfect, and that some plan of legislation is yet to be devised by which "good roads may be made not only from one town to another, but into and through every commune in France." M. Dupin complains equally of the system, although that of his own country. Before even a basket of stones can be laid down on a departmental road, it is necessary that an estimate of the expense should appear in the budget of the arrondisement, then of the department, and then be submitted to the bureau of Paris, which after due consideration is returned whence it came, and an engineer from the public school, an institution under the Home Department and maintained at

the public expense, is directed to proceed at his leisure and execute the repair.

The roads of Italy are well spoken of by travellers, and are generally kept in good order. In Milan, the tracks for the wheels are made of smooth stones. Some of those which cross the Alps are really wonderful. That of Mount Cenis renders a passage easy which was once a dangerous and difficult undertaking. It is a matter of doubt with the antiquarians whether the route was known to the ancients. Charlemagne crossed the mountain when he attacked the Lombards, and since then it has been well known. Napoleon, who on more than one occasion seemed to have that emperor before him as a model, resolved in 1802, to open a safe and durable road between Piedmont and Savoy, and the col or neck of Mount Cenis, so called from its being the neck or lowest depression in the main ridge allowing a passage, was chosen as the most feasible route. The French engineers projected it with great skill, and a carriage road of thirty miles in length, and from eighteen to thirty feet wide was made, at an expense of one million and a half dollars, and by the labor of 3000 men working five

months in the year for upwards of seven years. In 1815 this hitherto desolate and almost unfrequented pass, was thronged by 16,000 carriages and 34,900 mules and horses. Above the wild and romantic plain of St. Nicolo, it pierces a rock of granite for the distance of 650 feet. Houses of refuge twenty-six in number, are maintained by the income from tolls, and are provided for the benefit of travellers overtaken by fogs and snows, during which bells are continually rung to guide the steps of the wanderer. These houses, in the time of Napoleon, were tenated by a body of men called cantonniers who repaired the road, but the number is now reduced by the Sardinian government to fifty.

Another famous mountain road is that of Mount Genevre, which in 1802 was but a mule path. It is now in excellent order, and has been much used since 1804. An obelisk commemmorative of this work was defaced by the Austrians in 1817. There are several other roads in use, as that of St. Gothard, not so well maintained, though celebrated for its associations; but without such peculiarity as to demand a particular description. The Simplon, however, must not be for-

gotten. This is the most celebrated of them all. It crosses the Sempione, a mountain 10,-327 feet in height, and was the result of the genius of Napoleon, who constructed it at the joint expense of France and Italy. It is thirty-six miles long, and twenty-five feet wide, with so gentle a grade as to allow the heaviest wagons to pass up and down without difficulty. It is carried over precipices, deep gulfs, high bridges, and through the solid rock itself. The grand gallery over the Frassinone is 683 feet long, and the road may be described as a series of galleries and grottos ascending to a height of 6,000 feet above the level of the sea. Some of the gorges of the mountains through which it passes, are full of what the French term the "lovely horrors" of scenery. The views at different parts, whether towards Italy or Switzerland, are represented as truly magnificent, and numerous artists have seized upon them to give interest to their portfolios, or the annuals which are now produced in so masterly a manner. There are here also the houses of refuge and the cantonniers as on the route of Mount Cenis. Mr. Cooper, who has lately published a graphic account of his tour in Switzerland, and par-

ticularly mentions his ascent and descent of the Simplon, speaks rather disparagingly of the work, and as being excessively and unworthily praised. Yet his admiration breaks out at times in spite of himself, and he admits that he felt a sensation of wonder amid this wild and awe-inspiring scenery, which he approached upon a road with a surface as smooth as any floor.

Another traveller who preceded him a few years, Mariana Starke, whose name is connected with an itinerary almost as famous as that of Antoninus, speaks in warmer language than Mr. Cooper, of places realizing "the chaos of Milton and the inferno of Dante." We must also acknowledge, says the fair tourist, "that men who in defiance of such obstructions as these, could form a road exempt even from the appearance of danger, capable of braving the most furious storms, resisting the giant hand of time, and conducting human beings, cattle and every kind of carriage quickly and safely during all seasons of the year, through regions of eternal snow, deserve in point of genius to be ranked not only with, but above the ancient Romans."

It is a circumstance disgraceful to humanity, that on the downfall of Napoleon, his relentless enemies attempted to destroy the road, lest it should keep his memory in the minds of men, and thus prove a monument which should outlast the brass and marble of legitimate thrones!

Mr. Rogers in his beautiful poem of Italy, describes among other things, the passes over Mount Cenis and the Simplon, and softens down into the picturesque, what others would have treated as the terrific and wonderful.

> Like a silver zone
> Flung about carelessly, it shines afar,
> Catching the eye in many a broken link,
> In many a turn and traverse, as it glides.
> * * * * *
> Yet thro' its fairy course go where it will,
> The torrent stops it not, the rugged rock
> Opens and lets it in, and on it runs,
> Winning its easy way from clime to clime,
> Thro' glens locked up before."

The roads of Spain have been already alluded to in this treatise, as well as those of Switzerland for the sake of illustrating a principle of political economy. It may be well to add to what was there said, that they are in a miserable condition, and even the royal

roads save in the vicinity of the great towns, are no better. From Madrid to Burgos there are two good roads; there is another from Valladolid to Santander, and another to Bilboa. A diligence is now said to ply between Saragossa and Barcelona. The funds appropriated to their repairs are derived from tolls and local taxes, and amount to $450,000 per annum. The Edinburgh Review for July 1832, says that with the exception of a few high roads, (such as we have noticed) and which are sufficiently insecure, "there exists scarce a wagon or cart track through Spain. In Salamanca after a succession of abundant harvests, the wheat has been left to rot because it would not repay the cost of carriage."

The roads of Portugal are of the same character. In Germany the roads resemble those of France, except that little or no pains are taken with the foundation, and of consequence they are full of ruts and often impassable.

The Dutch on the other hand are very particular in the construction of theirs. The bed of the roads is carefully prepared, a cement of mortar is laid down, and upon this, bricks called clinkers are placed, with

their greatest diameters at right angles to the line of the road. The smoothness of these surfaces is much admired. An annual income of over one million of florins is derived from them by the government. It is said that the German and Prussian roads are cut up into ruts, and that it is a common contrivance to have the axles of their carriages so made, as to be enlarged or diminished at pleasure, to suit the tracks used in different provinces.

Mr. Russell the author of a late tour through Germany, states that the establishment of mails, called schnell wagons or velocity coaches, which travel at the rate of five or six miles an hour, at first caused considerable excitement. The ordinary diligence of the country is of a similar character with the roads. The luggage is placed behind on a flooring or projecting platform, nearly as long as the vehicle itself, and is piled up and secured with chains in total disregard of the centre of gravity. This process completed, the guard pays it no further attention. Six persons travel inside and two outside. The low roof, the straight backs of the seats and the invariable accompaniment of tobacco smoke, with a speed

of three miles an hour, are said to make a journey so disagreeable as to produce loathing ever after at the very recollection.

In these countries as in France, the travelling on the public roads is under the direction of the government, and very strict regulations exist as to the kind of carriages, the number of horses, and of the passengers. Among some items of information in these regulations, are mentioned the places where the carriage wheels are to be greased, and the fee that is to be paid on the occasion by the surprised traveller. All the guide books contain the rules of posting but they are so minute and various, that it would weary the patience of the reader to attempt their enumeration.

The roads of Sweden are said to be excellent and equal to those of England. They are constructed of stone with which the country abounds, and are laid out by skilful engineers. In Russia internal improvements are going on, although they are not yet very widely disseminated. The arts of war appear to be most in favor with the government. A few roads are made on scientific principles, but the high road from St. Petersburgh to Moscow is

only an elevated causeway of timber in one long unvarying line, over marsh and river, forest and field; and as it is constructed of logs joined together, it is in many places extremely rough. The trade of the interior is chiefly conducted by means of the rivers and canals during the few months they are navigable, or in winter by the use of sleds, over roads impassable at other seasons. One of the consequences of this state of things is very long credits to merchants living in the interior, because they cannot reach the commercial ports without great inconvenience and loss of time, and therefore they rarely come.

The roads of South America are scarcely to be considered such, and are only really good in the vicinity of very large towns. The traffic of the interior is carried on by the tedious aid of mules. The roads of some of the Eastern nations, such as China and of the Asiatic Islands, as already stated, are not without interest in the eyes of travellers, but throw little light on the scientific or commercial portion of our subject.

The roads of our own country have essentially changed their character within a few years past. They were passable in

summer and winter from the very nature of the soil and the climate, but in the spring and autumn, they were proverbially bad. Happily for us our numerous lakes and rivers, afforded facilities for transportation and travel to such a degree, as to make the evils of land carriage much more tolerable than they would otherwise have been. Accounts are preserved of journies made in the 17th century, between the then principal towns of our country, which required the exercise of so much patience, and consumed so much time, as to make the effort almost an act of heroism on the part of the travellers.

After the year 1803 a great many turnpike roads were constructed throughout the northern states.

The state of Connecticut incorporated a large number, and the cost of their construction varied from $500 to $2280 a mile. This was the expenditure on the road from New Haven to Hartford.

The income in 1809 was eleven per cent on the capital expended, as appears from an elaborate report of Mr. Gallatin, then secretary of the treasury of the United States.

The roads of Massachusetts were more expensive, some of them cost no less than $14,000 per mile. Those to Salem, Newburyport and Providence were of the best class. The grades were carefully adjusted at an angle no where exceeding 5 deg., and the surface was covered with broken stone. A speed of ten miles an hour was usual with the coaches on these lines. The route from Boston to Newburyport was the admiration of travellers: where an expense of $400,000 was incurred on a distance of but thirty-two miles.

In our own state the mania for turnpikes became excessive. During a period of seven years, sixty-seven companies were incorporated, with a capital of five millions of dollars, and liberty to construct three thousand miles of road.

Since 1810, upwards of two hundred and and sixty more have been incorporated with large capitals.

The direction of these roads was towards the lakes and along the rivers of the interior. Some of them were very expensive, such as that between Albany and Schenectady, which was made at an expense of $10,000 per mile and upwards, the actual

cost of those in the interior averaged much less, generally not exceeding $2500, or $3,000 per mile. Some of them were very profitable. The road from Utica to Canandaigua paid for many years a handsome profit to the stockholders. Generally they have never remunerated their proprietors, nor paid much more than the expense of actual repairs.

By the revision of the statute laws of this state, a complete code for the regulation of turnpikes and highways has been put in operation.

There is a large number of provisions in relation to turnpikes, as will be seen by reference to the law contained in the appendix.

Some of the principal features are as follows:

After the incorporation is obtained, the road is to be laid out by three commissioners appointed by the governor, having no interest in any turnpike, and not being residents of the county through which the road is to pass.

The width is prescribed to four rods, except in unavoidable circumstances, and nev-

er less than twenty-two feet. The material is also prescribed; stone, sound wood, or other hard substance, well compacted and sufficiently deep to secure a good foundation, the surface to be faced with gravel or broken stone of nine inches deep, rising with a gradual arch in the centre.

The law regulates the ditches, milestones, guide boards, the assessments for land taken, the tolls, the tire of carriages and other matters of a similar nature. All persons going to church, or a funeral, their usual grist mill or black-smith shop, to their physician, to court as a witness or juror, to an election or town meeting, and those living within one mile of a gate if passing on their own business, all state and national troops, are exempted from paying tolls. The common roads or highways of the state are regulated by one hundred and thirty-two sections of the Revised Statutes and subjected to the control of commissioners and overseers of highways. The commissioners have power to lay out and discontinue roads, to divide towns into districts, to assess road labor on land owners and resident males of the age of twenty-one years. The overseers have the special du-

ties of superintendents. Many other provisions exist for the maintenance and government of the roads, to which we must refer those who wish fully to understand the details.

New Jersey, under the same impetus, undertook the construction of turnpikes. The great thoroughfare was between Trenton and Brunswick. Here the angle of ascent was not greater than three degrees in any place. The expense averaged about $2,500 per mile. Another was extended from Brunswick to Easton on the Delaware, but long before its completion, the original funds of the company were exhausted.

Pennsylvania did not hold back at this period. Numerous "stone" roads were made throughout the state. The Bristol and Trenton, the German and Perkiomen, the Lancaster, Columbia and Pittsburg roads were all considered important public works. To some of these the state made subscriptions of money and of credit. The angles of the grades were about four degrees. Some of the roads cost $10,000 per mile, and others 14,000. The tolls received were not enough to pay the interest and cost of repairs. It appears that the lower stratum

of these roads was generally broken stone of the diameter of five inches. The one above it of half that diameter, and the two in some instances were nearly thirty inches thickness. The surface of the roads had a slight convexity, and was sometimes covered at top with gravel. Whatever the defects of construction might be in view of the present received systems of Telford and McAdam, the Pennsylvania roads enjoyed a high reputation, and the metropolis felt their good effects, in the great extension of her internal trade, the enhanced value of her property, and the increased magnitude of her resources.

The roads of Maryland were also pushed forward with great spirit. Some of them cost $2,000, some $7,000 and others $10,000 a mile on an average. The great road was that of Frederickton, designed to divert the western trade, and by connection with the Cumberland road to reach the navigable waters of the Ohio. The principles of construction were the same as those adopted in Pennsylvania. South of the Potomac but little was effected, and up to the present time, with the exception of a few rail-roads, the Southern states have not done much to

increase their home trade, or the facilities of intercommunication.

The Cumberland road which runs from a town in Maryland on the Potomac to Wheeling on the Ohio, was made at the expense of the nation, and cost them $1,800,000. As late as the year 1831 the enormous sum of $200,000 and upwards, was appropriated to its repair. The utility of this road is no longer doubted, and though it is debated whether the constitution contains any authority for its construction, yet annual expenditures are still authorized in the face of the objection, for the improvement of this and other roads in the western and southern states. In an able report of the committee on roads and canals made to the House of Representatives in 1822, and attributed to the pen of Judge Hemphill of Pennsylvania, the constitutional power of Congres sis there ably, though only incidentally asserted.

In the message of Governor De Witt Clinton to the legislature of this state in the year 1818, he remarked the imperfections of the then existing turnpike laws of our own state, and stated that the condition of the roads was a "subject of general and well founded complaint."

In his message the following year, he particularly calls upon the legislature to encourage the construction of roads, "as an incumbent duty and a beneficial exercise of power." Again in 1820, he urged on their attention the establishment of roads and bridges, by all the motives which suggested themselves to his powerful and comprehensive mind. So far from exhibiting himself as the exclusive friend of canals, it will be found on examination, that the subject of roads was with him a constant source of solicitude and a frequent theme of solicitation. To his influence, we may indeed attribute most of the reforms which took place in the existing laws with reference to this subject.

The present generation do not realise all the greatness of De Witt Clinton. A degree of familiarity with his person, a knowledge of his want of political address, and prejudices embittered by party strife have made us less sensible of his merit than we should have been, had his position in public life been entirely independent of popular caprice. But though he was doomed to experience many of the severer ills of life, and to suffer the consequences of being in advance of the age, its information and its

opinions, though he went to his grave with a consciousness that his labors and his policy, were not all fully appreciated, posterity, that impartial judge, will do him justice; and the state of New-York will one day feel that its highest glory, and its proudest boast are these, that here was his birth place, here his sphere of action. Mere politicians may wax and wane through their phases of official greatness, but the name of CLINTON shall survive place and placemen, to be the veneration and love of all succeeding time.

The increase of our population, however, required additional facilities, not to be obtained by the slow operation of wagon transportation. The long trains drawn by six or eight horses, occupying several weeks in a journey, now performed with the heaviest articles in a few days, were not characteristic of our citizens, nor adapted to the necessities of our country. The canals, those honorable monuments of the well directed energies, and the well sustained credit of our state, supplied the more urgent demands of commerce. These after fertilizing and enriching our western domain, pour into the public coffers an imperial revenue. But the later adoption of rail-roads has made the

system of intercommunication perfect. With their usual energy, the American people have seized upon it at once, and in this we have already outstripped our competitors, and surpassed our teachers.

This invention distinguishes modern times from all others. The ancients have been considered by enthusiastic classicists, as the true mental giants, and the moderns but dwarfs in comparison. But it has been well remarked that if the moderns *are* dwarfs, they have mounted on the shoulders of their predecessors, and have attained, therefore, a much greater elevation. It is very singular however, that the greatest improvements are resolvable into the simplest elementary principles. In statuary, for instance, the perfection of the art consists in its close resemblance to the simplicity of nature. Some of the finest improvements in mechanics owe their origin to the contrivances of the animal frame; and rail-roads that seem about to revolutionize the relations of society, and "annihilate time and distance" (as once was the prayer of romantic love,) are resolvable into the simple effects of smoothness and hardness, two of the most familiar of the qualities of matter. To these the

power of steam has at last been made applicable, and it finds a limitless field for its operations.

The subject of rail roads has called forth so many writers whose works are within every one's reach, that the attempt to treat it other than in a general way, would now be but a loss of time. Suffice it to say, that they have existed in England since 1676, if not earlier, although their real utility remained unsuspected until a few years past. Of course they were originally of the rudest character, and used principally for the transportation of coals from the mines to some place of shipment. One hundred years afterwards they were improved at the Sheffield collieries by the addition of iron plates to the wooden rails. In 1797 stone foundations for the superstructure were adopted by Mr. Barnes at the New-Castle mines, and in 1800, they were used in Derbyshire. The first clear manifestation of their utility was evident in 1825 through the successful operations of the Stockton and Darlington railway, and in 1830 the Liverpool and Manchester road went into operation, surpassing in all respects the warmest anticipations of its

friends. Other great roads have since been completed in England, particularly that between London and Birmingham. Some small ones are in successful operation in Ireland, and the plan of a grand route across the island from Valentia, the projected port of the Atlantic steam packets, is also under discussion. They have been introduced into France, Belgium, and Russia, and will probably become universal throughout Europe.

A considerable number have been constructed in our own country, and are in successful operation. It would be needless to take up time by a minute description of the American rail roads, since the encyclopedias, guides, and pocket books of the country, abound with details, maps and profiles of all the most celebrated.

An important and as yet an unsettled controversy has arisen abroad in relation to the comparative merits of rail roads and canals, and the debate was at one time equally warm in the United States. Tables have been constructed by which it is shewn that at a speed under three miles an hour, the advantages of horse power upon canals is as 4 to 3 in favor of the latter. Above that velocity the advantages rapidly increase in fa-

vor of rail roads. At a rate of twenty miles an hour they are preferable to canals in the ratio of 5 to 1. Over turnpikes they have a still more decided advantage, the item of friction alone being twenty times less, according to Dr. Lardner, on the one than the other.

The developement however of a new law of resistance, inferred from actual experiments made in Scotland upon the canals of that country, had a tendency to make speculators more wary for a time in the purchase of rail-way shares. We say for a time only, because the confidence in rail-ways is now greater than ever, and England will be soon traversed by them in all directions.

In 1830 a species of light craft, made of sheet iron, and called swift boats, were constructed to ply at a speed of nine and a half miles an hour, upon the Paisley canal, where at this time, an average speed of ten miles is said to be maintained. The canal is shallow, narrow and crooked, and only twelve miles in length. The boats are seventy feet long, five feet six inches broad, the roofs are of wood covered with oiled canvass, and the hulls are formed of light iron ribs and plates. They usually carry seventy passengers, but sometimes have as many as one hundred and

ten. The entire cost of each is $625, and the value of the two horses that draw them in stages of four miles each, is $250 a pair. They travel this distance in twenty-two minutes, and each team performs its route about four times a day. It is asserted that the actual cost of each boat, including interest of capital, deduction for sinking fund, wear and tear, and indeed every item of expense, is but £2 2*s*. 4*d*. per day, while the receipts at a penny per mile for each passenger in the best cabin, alone amount to £4 per day.

Experiments were carefully made by Mr. McNeill, the author of a work on the resistance to the passage of boats on canals and other bodies of water, to ascertain the truth of the long received law that the resistance is as the square of the velocity. By the use of his dynamometer, the speed of an iron passage boat weighing three and a half tons and drawn by two horses, at the rate of ten miles and a fraction of a half mile per hour indicated a resistance of 285 lbs. and a fraction over, when by the old theory it should have been 429 lbs. The cause of this disparity is explained by the emergence of the boat from the water, but this has not been

mathematically demonstrated. One result developed itself as a consequence of this new principle, that a horse could do 270 per cent more work on a canal than is allowed by Tredgold, and 750 per cent more than allowed by Wood. The attendant ripple of these boats is said not to be greater than that of a canal boat moving at the rate of four miles an hour. The system of light boats has been introduced in England, after having been successfully tried on the principal canals of Scotland.

In a very entertaining and useful work recently published by Sir George Head, a brother of Sir Francis, the performance of the English boats is particularly stated. The Arrow, built after the Scotch model, and drawing but twelve inches of water with forty passengers and all their luggage, plies on the Carlisle and Annan canal at the uniform rate of ten miles an hour.

Two similar boats, the Waterwitch and Swiftsure, ran upon the canal from Preston to Kendall, and accomplished a distance of fifty-seven miles, passing seven or eight locks, in seven hours. In these instances, he describes the fatigue of the horses as being distressing and injurious in the extreme,

and he seems to think that the injury done them a great and decided draw-back to the supposed gain of speed.

Although the advantages of rail-ways in the transportation of passengers and light articles are well understood, and indeed much more than these are claimed for them by very eminent writers, many things are yet to be tested before their maximum effect can be realized. As an example, engineers yet differ whether it is best to concentrate the inequalities of a grade in one part of the line of road, or spread them over the whole. Whether stationary engines are most economical and convenient, or whether additional locomotive power should generally be employed in their stead. Some eminent persons contend that where the inclination exceeds twenty-one feet in a mile, the same power will transport a weight either way equally well, and is the same that would be necessary for an equal distance on a level rail-way. Where speed is preferable to other considerations it is best unqestionably to use locomotive engines to the full extent of their capability. Dr. Lardner estimated its limit of usefulness to a grade of fifty feet in the mile, and contends that

beyond that stationary engines are necessary. This however is denied. Satisfactory experiments have been made in this country to show that grades of much greater elevation may be successfully worked by locomotives of American construction. Mr. Baldwin of Philadelphia has produced them of sufficient power to ascend an inclined plane of 2745½ feet, having an elevation of $187\frac{3}{10}$ feet in that distance, being upwards of 350 feet in a mile, at full speed, with a train of cars containing passengers. The details of that experiment not being within reach, it may be well to refer to a similar one made by an engine manufactured by Mr. Norris of Philadelphia, upon the same plane. It ascended with two cars and sixty-three passengers in three minutes and fifteen seconds. The gross weight including engine and tender was 48,500 lbs. On descending, eighty more passengers were added to the load, and yet the engine and train were found perfectly under control, and were three times brought to a dead stop at the pleasure of the engineer, and to the astonishment of all present. Several of our most important rail-ways are graded in some parts of their lines as high as eighty feet to the

mile, and are in successful operation. The great western rail-way to connect Boston and Albany is graded on this principle. It is not proper however to consider this subject as entirely settled, since the opinions of scientific men are still at variance in relation to it.

Another consideration connected with the construction of rail-ways has not been sufficiently attended to, the necessity of having the best preliminary surveys. If after a line is marked out, a better one is discovered, an absolute loss to the proprietors will have accrued by the difference of the cost of construction, and the wear and tear of transportation, which might have been avoided. Many of our roads have been laid out too hastily. A very high degree of talent is necessary in this department of civil engineering, and scientific attainments of the most profound character will find themselves fully employed. The mathematician here finds the value of his previous studies. He is called upon to put in practice his knowledge of curves, of resistance, of gravity, and motion. How beneficial the change of this direction of his studies. Too often employed in calculations, which have tended to

render the bullet more certain and the shell more deadly, he now traces out the lines of a peacefully travelled road, where the quiet pursuits of life are hastened to a prosperous conclusion.

A good engineer is not only a theorist but a practical man. He ascertains the amount of transportation ascending and descending, the character of the country, the nature of the soil, its products, the facility of material, of draining, the necessity if any of deflections in the line of his road, the number and location of the curves, and each particular involves the most extensive and careful calculations.

The details of construction have also their questions. The best kinds of rails, their weight and form, the most suitable guage the strength of the various materials, the form of embankments, of viaducts, the best sidelongs or turnouts, require great experience and skill in the engineer.

When the road is finished, then come other embarrassments. The force of effective traction, of friction, the form, stability and power of locomotive engines, present themselves for consideration. Volumes are written on these points and there is yet room for

more. There are upwards of sixty different kinds of locomotive engines known to scientific men; and their various pretensions and the principles of their construction are subjects of continued interest. It is indeed astonishing to think what a field has been opened to research by the application of steam to the propulsion of locomotive and marine engines. A recent writer of eminence excused himself for entering upon the subject, by hinting, how much was yet to be reduced to general principles, in the operations of rail-way engines. Thus the pressure of steam in the boilers, hitherto thought to be invariable in the same engine, the indications of the safety valve, the pressure of steam in the cylinders, the evaporating power, the lead of the slide, or in other words, the amount of opening left in the induction valves purposely to produce an easier and swifter motion of the piston rods, a rule of equation determining the practical power of an engine, the velocity and load of a locomotive, the form of the wheels best adapted to passing curves, their size as best adapted to speed, and the consumption of fuel, are matters not fully understood and not yet perfectly systematised. In time these and oth-

er difficulties will have been overcome by talent and experience.

That a constantly high rate of interest can be expected from investments in rail roads is we believe an error which time will rectify. Under the best possible management, the expenses can never be brought to an invariable standard. Such must be the number of agents, such the necessity of constant renovation, such the casualties, and such the wear and tear of the operating power, that entire certainty can not be expected. But few cases have occurred where the outlay has kept within the estimates of the engineers. Perhaps this is all for the best. For did any one pursuit of men assure unerringly a higher profit than the rest, all would make it their business.

No investment contrived by human ingenuity ever produced uniform results. Even the gold finder often ascertains to his satisfaction that his is a losing occupation. So of rail roads. Their utility will commend them to the favor of the public, and if they should fall below the standard of profit which the sanguine have assigned them, they will become the property of capitalists who seek less returns for their money, than the mere

speculator, or be owned by the States in which they are constructed. These can afford to overlook the mere advantage of income, in the general prosperity they diffuse among the people.

But there are other views of this subject which are equally striking in a political sense.

The vast increase of rail-ways as the most useful and expeditious mode of conveyance, will tend in a great degree to the neglect of the turnpikes and country roads. This will, in fact, subject the business and convenience of the public to the rules and regulations of private companies; for if the existing highways become impassable from neglect, or through the superiority of rail-way conveyances in their neighborhood, either they must be kept in repair by the few who continue to use them, which may prove a heavy burthen, or else the public should have some control over the rail-ways which they are thus in a measure compelled to travel. It is therefore a wholesome provision in some charters, that the roads authorised by them, may become public property at a future day, upon repayment of the capital, with an interest of ten or fifteen per cent per annum.

The permanency of these structures is a question much agitated. In Europe they are much more expensively constructed than in our own country, and some of the staunch advocates of legitimate thrones, and the political ascendancy of an aristocracy of church and state, contend that the slightness of our rail road structures, is the result of our institutions, and the constitution of our society. They say that our rail roads are projected in the consciousness of the uncertainty of our government, and that our "lives, laws, securities, private engagements, public treaties, religion, morality and all, float upon the uncertain will and irresistible passions of the multitude."

This is a superficial remark. The reasons which operate on the minds of capitalists are these, that to make an investment in a railway which should not bring a rate of interest equal to that ordinarily received from other investments, would be an act of folly, and such a one as no English capitalist would make in his own country. The secret with us lies in the deficiency of capital. When we have acquired as much private wealth as England, and a low rate of interest becomes universal, then our rail-ways

will be built at as great an expense as hers, but not before. An outlay which will here return ten per cent, would bring but two, if the expense of construction were increased five-fold.

That the instability of our institutions does not affect this question, is evident from the expenditures every where made on our public buildings, bridges, churches and canals. And those British writers who assert that we look with "admiration and envy" on those institutions of theirs which protect "the property of the few from the Briarian fingers of the many," forget one grand principle of our institutions, which is that the many have no inducement to plunder the few; no unequal or unjust laws compel them to be hewers of wood and drawers of water to a privileged order, or to give place to the artificial creations of society, which have no real or just foundation. Property must be more secure here than in any other country of the world, because it cannot be taken away by taxation without consent of the owners, and because it is the interest of *every* citizen, that his own earnings should be protected, in order that he himself may acquire property. This a principle seated so deeply in hu-

man nature as not to allow any doubt upon the subject.

On the contrary, in that country where its wealth lies in a few hands, and by its very institutions and laws must be there for ever retained, where the majority of its people are condemned to hopeless poverty, there is far greater danger of the insecurity of property than any other. Nothing but an outlet to the mass of the discontented by emigration and colonization has kept, or can keep such a country from revolution.

To return from this digression, it follows that if the public interests should prove to be impaired by this practical monopoly of the right of way, and by the fixing of the time, the place and the mode of travelling, at the option of the carriers rather than the carried, it is urged that they should in some way be regulated by the public authorities and subjected to scientific control.

The Columbia rail road, which is the property of the State of Pennsylvania and is under the direction of the sate authorities, now pays its incidental expenses, and the interest of the capital. It has proved of vast importance to the public even at a time when its receipts were not remunerating, and

it must continue to be an important thorough-fare.

Another consideration connected with the subject, is the question of the successful application of steam to the propulsion of carriages upon turnpike roads, and the effect this may have on rail-ways. Many such engines have been built, and some have actually plied for months together. Treatises written by confident inventors have been published from time to time, asserting their advantages, and the certainty of success, and parliamentary inquiries have been made at great length to ascertain the truth of these pretensions.

It may be safely predicted of this branch of locomotion, that much yet remains to be accomplished before it can compete even on the best turnpikes, with locomotion upon rail-ways.

Having now briefly discussed our subject, it may be expedient to allude to one other consideration, that of the unceasing opposition, which men of contracted views offer to the extension of the general system of internal improvement. This opposition is as old as civilization, and perhaps is a useful ingredient in the composition of society. Were

there no gravity, and no friction, the very tendencies of matter would become dangerous, and were there no croakers and no sceptics, we should perhaps be the creatures of imagination and of hope. Still as there is enough of doubt in the world, to keep down the enthusiasm of genius, especially where it attempts to erect its fabrics with the wealth of others, the friends of society and the advocates of internal improvement must not relax their efforts, nor their arguments, if they wish to see the march of improvement continue. It may therefore safely be laid down as an axiom, that whatever creates business, facilitates intercourse, and unites communities, tends to their comfort and advantage, and confers benefits upon men, of value infinitely beyond an estimate in dollars and cents. No statesman, no people, no government can go wrong in thus consulting the public good. Every measure founded on this basis, will stand the "test of scrutiny and time."

Nor is another consideration unworthy of notice, that the expenditure of money in public improvements is not a loss of the amount expended, nor is a debt based on a

productive work an evil of the character it has been assumed to be. The opponents of the Erie canal talked of the State debt it was about to create, as a measure of certain destruction to the prosperity of the people. They did not understand that vis medicatrix in political economy, by which such expenditures of capital are replaced; nor knew that the voluntary contributions of trade, commerce, and travel upon our established thoroughfares make up in a short time, sums equal to the most liberal outlay of capital.

The Erie canal has not only repaid its cost, and furnished means for other improvements, while it also remains the property of the public, but the very money which it cost that public, has, to more than an equal amount been gained in the enhancement of values in its vicinity, in the increased profit of land, the establishment of towns and cities, mills and manufactories, and the employment furnished a large and increasing population.

It is possible another objection may be taken to the prosecution of works of internal improvement—that they have a tendency to increase unequally the wealth of

certain portions of the community. The philosophy of some minds is to oppose all measures, which appear to remunerate capital as well as labor.

This is an unworthy spirit in a country where labor becomes capital sooner than in any other in the world. Let us suppose that the most radical of the Roman agrarians were amongst us, and could induce us to adopt his theory in its widest sense.

Suppose our roads and canals were blotted from our maps, and each citizen lived exclusively for himself. However independent in his feelings, or desirous of remaining so, he would find his own ingenuity and personal exertion insufficient to supply some of his most urgent wants: nor is this all, he could not find leisure, even if he had ingenuity. He must either forego at once the accustomed enjoyments of life, or be content with an existence no better than semi-barbarous. A bad crop or a sick family would plunge him into the deepest distress. Did he seek employment as a means of relieving his wants, he would be compelled to await his remuneration at the pleasure of his employer, who would be equally dependent on his own labor, or his expected crop. For no

man could have a supply on hand, the accumulation of property being contrary to the fundamental principles of agrarianism.

The unavoidable tendency of this state of things would be to reduce the motives of men to the mere object of obtaining food and clothing, and any attempt to surpass their neighbors in the abundance or quality of either, would also be resented as an attempt to create wealth in an undue degree.

Upon tracing out the inevitable consequences of this principle, we perceive that ignorance and squalid poverty would possess the land, the intellectual would yield to the physical, and all the high impulses of our nature be sacrificed to but little better than animal instinct.

We have examples of semi-barbarism, teaching us its degradation in the annals of almost every nation. The nearer we go back to periods, when internal improvements were unknown, and the objects of men were mere existence, the more degraded do we find their condition.

In the times of the early Britons who retrograded in civilization after the departure of the Romans, it is evident that though they were unquestionably actuated by a

high love of freedom, they never knew its real advantages. Ignorant of the arts of peace, and the benefits of a commercial system, they were compelled in their dealings with each other to rely on what was termed animal money, as the medium of exchange. So little had they advanced in the arts of life, that they graduated a scale of prices for their domestic animals, which were received in payment of their debts. It is not worth while to allude to the nature of such a currency as this, and its utter inapplicability to the wants of a refined and intelligent people. However much the system of credit may be derided, we imagine no one at the present day would advocate the adoption of "animal money."

While other nations boast of their antiquity, we rejoice in the strength of our youth, and in the energy of our purpose.

Others may point to their piles of masonry, which have occupied centuries in construction, and quote their ruins as the proofs of early civilization. We aim at no such distinction. We are for making life, brief as it is, the means of infinite good, and giving to its ordinary limits, opportunities,

privileges and enjoyments, which mere antiquity could never give.

The opening of communications is one of the first duties of any country which desires to increase its wealth, its resources and its power. Without them, no permanent advances can be made.

Let our course then be onward. If all we have accomplished as a nation, or as communities is but the work of *yesterday*, let us not forget that it is equally in our power, to have a bright *to-day*, and a still more glorious *to-morrow*.

APPENDIX.

APPENDIX.

NOTE.

In order to render the foregoing treatise more generally useful than it would otherwise be, this appendix is added, containing some particulars in relation to the subject discussed, which could not be conveniently inserted in any other place.

PAVEMENTS.

The following are the different kinds of pavements known and described in the works of English road makers.

1. Pebble paving, used in ornamental design, done with kidney shaped stones, obtained from Guernsey, and when well laid, extremely durable.

2. Rag paving, with stone obtained from Maidstone, Kent, whence the name Kentish Ragstone. There are square stones of this material for coach tracks and footways. This kind of paving was once much used in London.

3. Purbeck pitchers. Stones from 6 to 10 inches square, and 5 deep, brought from the island of Purbeck, and used in Court yards.

4. Square paving: being of cubical stones of blue whynn—called Scotch paving—out of use.

5. Scotch granite: used for the London road pavements.

6. Guernsey and Herm blue granite. Extensive quarries are now opened to supply the London market. The stones are dressed in form of a prismoid, and laid with the ends down, bedded in gravel.

7. Purbeck paving, of blue stone in large surfaces $2\frac{1}{2}$ inches thick, used for flags.

8. Yorkshire paving, of large dimensions, impervious to water, and unaffected by frost.

9. Ryegate or fire stone paving: used for hearths, stoves and ovens.

10. New Castle flags: about 2 feet square and 2 inches thick, for out door offices.

11. Portland paving—from Portland: sometimes interspersed with black dots.

12. Swedland paving: a black slate dug in Leicestershire, much used for paving halls and party color paving.

13. Marble paving: party colored, mosaic, or plain.

14. Flat brick paving: laid in sand and mortar, or grouted.

15. Brick-on-edge paving.

16. Bricks laid in herring-bone fashion.

17. Bricks set endwise.

18. Paving bricks prepared specially for the purpose.

19. Ten inch tiles.

20. Foot tiles.

21. Clinkers: used in stables.

Nor are these all: numerous inventions applicable to these and other materials, all have their reputation and supporters.

ASPHALTUM.

The mineral bitumen used for the composition of cement, is procured chiefly from the Lower Rhine, from the Parc in the Department of Ain, and from the Puy de la poix, from the Puy de dome. *Boiled Coal tar* will do as well. In these localities, is found the limestone impregnated with bitumen, which gives consistency to the cement. It is well dried, ground to powder, sifted and stirred while hot, in about one-fifth its weight of melted asphaltum, contained in a cast iron boiler. Dry chalk or bricks, ground or sifted will do as well. As some of this paste is made homogeneous, it is lifted out with an iron shovel and spread in rectangular moulds, fastened on a surface of smoothed planks covered with sheet iron, the sides of the moulds being smeared with a thin coat of loam paste to prevent adhesion. When the composition cools, it is removed by an oblong spatula of iron, and

is then in the form of bricks 18 inches long, 12 broad, 4 thick, of the weight of 70 lbs. each.

URE.

CONSTRUCTION OF ORDINARY ROADS.

So much has recently been written, and so much said in order to enlighten the public mind on the subject of roads, that little remains to be done but to follow out the principles and practice of the most approved Engineers of the old world.

The subject presents itself in the following form:

Laying out of a Road. The first duty of the Surveyor is personally to inspect the proposed line and the country through which it passes.

It may be laid down as a rule that the best line between the two given points, is that which is shortest, most level and most easy of execution. This is varied sometimes by the consideration of the cost of repairs, the amount of traffic to pass over it, the natural obstructions, such as hills, vallies and rivers.

In laying out a road for the transportation of country produce merely, due estimates must be made of the burthen to be carried, with the usual power of draught.

On public roads, speed may be considered as the principal object in the calculation of the levels.

Lines of road must not be made too tortuous, even to gain ease of draught, for there is danger to carriages from the suddenness of their turns, and the danger of collision.

The true method of finding out the proper line of road, is to ascertain and mark at proper distances the straight line: then, a search on either side of it for a better line, is easy and practicable; and may be made with greater economy, in all respects.

A competent surveyor should be employed to run the line, furnished with proper instruments and materials. The memoranda of the field book should be protracted and laid down on a large scale. Some engineers recommend the adoption of 66 yards to the inch for the ground plan, and 30 feet to the inch for the vertical section. On the latter, should be marked the horizontal distances in miles, and the vertical heights in feet.

Calculations should be made of the cubic yards of earth to be removed: the grades should be carefully adjusted; the strata examined, and the character of the materials at hand for the work.

According to Stevenson, and we believe to all the most scientific road engineers, a level straight road is decidedly the best. He says, "in an uphill draught, a carriage may be conceived as in a state of being continually lifted by increments proportional to its use or progress upon the road. Every one knows that on a stage of twelve miles, the post-boy generally *saves*, as it is termed, at least half an hour, upon the level road; because on it he never requires to slacken his pace, as in going uphill. Now, if he, or his company, would agree to take the same time to the level road, that they are obliged to take on the undulating one, the post-master would find no difficulty in deter-

mining which side of the argument was in favor of his cattle. With regard to the fatigues or ease of the horses, Mr. Stevenson upon one occasion submitted the subject to the consideration of a medical friend, (Dr. John Barclay of Edinburgh, no less eminent for his knowledge, than successful as a teacher of the science of comparative anatomy,) when the Doctor made the following answer:—'My acquaintance with the muscles, by no means enables me to explain how a horse should be more fatigued by travelling on a road uniformly level, than by travelling over a like space upon one that crosses heights and hollows; but it is demonstrably a false idea, that muscles can alternately rest, and come into motion, in cases of this kind. The daily practice of ascending heights, it has been said, gives the animal wind, and enlarges his chest. It may also, with equal truth, be affirmed, that many horses lose their wind under this sort of training, and irrecoverably suffer from imprudent attempts to induce such a habit.' In short, the Doctor ascribes 'much to prejudice originating with the man, continually in quest of variety, rather than the horse, who, consulting only his own ease, seems quite unconscious of Hogarth's Line of Beauty.'"—*Report on the Edinburgh Railway.*

A dry foundation, and clearing the road from water, are two important objects, which, according to Walker, (*Minutes of evidence before a Committee of the House of Commons*, 1819,) ought to be kept in view, in lining out roads, "For obtaining the first of these objects, it is essential that the line for the road

be taken so that the foundation can be kept dry, either by avoiding low ground, by raising the surface of the road above the level of the ground on each side of it, or by drawing off the water by means of side drains. The other object, viz. that of clearing the road of water, is best secured by selecting a course for the road which is not horizontally level; so that the surface of the road may, in its longitudinal section, form in some degree, an inclined plane: and when this cannot be obtained, owing to the extreme flatness of the country, an artificial inclination may generally be made.—When a road is so formed, every wheel-track that is made, being in the line of the inclination, becomes a channel for carrying off the water much more effectually than can be done by a curvature in the cross section, or rise in the middle of the road, without the danger or other disadvantages which necessarily attend the rounding of the road much in the middle. I consider a fall of about one inch and a half in ten feet, to be about a minimum in this case, if it is attainable without a great deal of extra expense.

The ascent of hills, it is observed by Marshal, is the most difficult part of laying out roads.—According to theory he, says, an inclined plane of easy ascent, is proper; but as the moving power on this plane is "neither purely mechanical, nor in a sufficient degree rational, but an irregular compound of these two qualities, the nature and habits of this power" require a varied inclined plane, or one not a uniform descent, but with levels or other proper places of rest. According to the road act, this ascent or de-

scent should not exceed the rate or proportion of one foot in height to thirty-five feet of the length thereof, if the same be practicable, without causing a great increase of distance.

All crossings, intersections, and abuttings of roads should be made at right angles, for the obvious purpose of facilitating the turning from one road to the other, or the more speedily crossing. Where roads cross each other obliquely, or where one road abuts on another at an acute angle, turning in or crossing can only be conveniently performed in one direction.

In laying out a road over a hill or mountain of angular figure and considerable height, much practical skill, as well as science, is requisite. In order to preserve a moderate inclination, or such a one as will admit of the descent of carriages without locking the wheels, a much longer line will be required than the arc of the mountains. In reaching the summit or the highest part to be passed over, the line must be extended by winding or zig-zaging it along the sides, so as never to exceed the maximum degree of steepness. This may occasion a very awkward appearance in a ground plan, but it is unavoidable in immense works.

In laying out a road towards a river, stream, ravine, or any place requiring a bridge or embankment, an obvious advantage results from approaching them at right angles; and the same will apply in regard to any part requiring tunnelling or crossing by an aqueduct, &c.

The width is obviously determinable by the nature and extent of the traffic: every road should be made sufficiently broad to admit two of the largest sized carriages which are in use in the country or district to pass each other; and highways, and roads near towns, should be made wider in proportion to their use. The maximum and minimum can only be determined by experience; sixty feet is the common and legal width of a turnpike-road in Britain, and this includes the footpath.

The strength of a road depends on the nature of the material of which it is formed, and of the basis on which it is placed. A plate of iron or stone, of the road's width, placed on a compact dry soil, would comprise everything in point of strength; but as it is impracticable to employ plates of iron or stone of such a size to any extent, recourse is had to a stratum of small stones or gravel. The great art, therefore, is to prepare this stratum, and place it on the basis of the road, as that the effect may come as near as possible to a solid plate of material. To accomplish this, the stones or gravel should be broken into small angular fragments, and after being laid down of such a thickness as experience has determined to be of sufficient strength and durability, the whole should be so powerfully compressed by a roller, as to render it one compact body, capable of resisting the impression of the feet of animals and the wheels of carriages in a great degree, and impermeable by surface water.—But the base of the road may not always be firm and compressed; in this case, it is to be rendered so by

drainage, artificial pressure, and perhaps in some cases by other means.

The durability of a road, as far as it depends on the original formation, will be in proportion to the solidity of its basis; the hardness of the material of which the surface-stratum is formed; its thickness, and the size and form of the stones which compose it. The form and size of the stones which compose the surface-stratum, have a powerful influence on a road's durability. If their form is roundish, it is evident they will not bind into a compact stratum; if they are large, whether the form be round or angular, the stratum cannot be solid; and if they are of mixed sizes and shapes, though a very strong and solid stratum may be formed at first, yet the wheels of carriages and the feet of animals operating with unequal effect on the small and large stones, would soon derange the solidity of the stratum to a certain depth; and, consequently, by admitting rain and frost to penetrate into it, accelerate its decay. A constant state of moisture, even without any derangement of surface, contributes to the wearing of roads by friction: hence one requisite to durability is a free exposure to the sun and air, by keeping low the side fences; and another is keeping a road clear of mud and dust—the first of which acts as a sponge in retaining water, and the second increases the draught of animals, and of course their action on the road. Both the strength and durability of a road will be greater when the plate or surface-stratum of metals is flat or nearly so, than when it is rounded on the upper surface: first, because no animal can stand

upright on such a road with a regular bearing on the soles of its feet; and, secondly, because no wheeled carriage can have a regular bearing, except on the middle or crown of the road. The consequence of both these states is the breaking of the surface of the plate into holes from the edges of horses' feet, or ruts from the plough-like effect of wheels on the lower side of the road, or the reiterated operation of those which pass along the centre.

The smoothness of a road depends on the size of the stones, and on their compression, either by original rolling or the continued pressure of wheels. The continued smoothness of a road during its wear depends on small stones being used in every part of the stratum: for if the lower part of it, as is generally the case in the old style of forming roads, consists of larger stones, as soon as it is penetrated by the wheels or water from above, these stones will work up and produce a road full of holes and covered with loose stones.

The wear or decay of roads takes place in consequence of the friction, leverage, pressure, grinding, and incision of animals and machines, and the various effects of water and the weather.

SUBJECT II.

McADAM'S THEORY AND PRACTICE OF ROAD-MAKING.

McAdam agrees with other engineers that a good road may be considered as an artificial flooring,

forming a strong, solid, smooth-surfaced stratum, sufficiently flat to admit of carriages standing upright on any part of it, capable of carrying a great weight, and presenting no impediment to the animals or machines which pass along it. In forming this flooring, McAdam has gone one step beyond his predecessors, in breaking the stone to a smaller size than was before practiced, and in forming the entire stratum of this small-sized stone. By the former practice a basement of large stones is first laid; then stones a degree smaller; and, lastly, the least size on the surface. It is in this point of making use of one small size of stones throughout the stratum, that the originality of McAdam's plan consists, unless we add also his assertion, "that all the roads in the kingdom may be made smooth and solid in an equal degree, and to continue so at all seasons of the year." It is doubted by some, whether this would be the case in the northern districts at the breaking up of the frosts, and especially in the case of roads not much in use, and consequently consisting of a stratum less consolidated, and more penetrable by water. McAdam, probably, has much frequented public roads in view. "The durability of these," he says, "will, of course depend on the strength of the materials of which they may be composed; but they will all be good while they last; and the only question that can arise respecting the kind of materials is one of duration and expense, but never of the immediate condition of the roads." (*Remarks on Roads, &c.* p. 11.) The following observation of Marshal is worthy of remark, as tending to confirm,

to a certain extent, the doctrine of McAdam:—"It may seem needless to repeat, that the surface of a road which is formed of well broken stones, binding gravel, or other firmly cohesive materials, and which is much used, presently becomes repellant of the water which falls upon it; no matter as to the basis on which they are deposited, provided it is sound and firm enough to support them."

McAdam's theory of road-making may be comprised in the following quotation from his *Report to the Board of Agriculture*, (vol. vi. p. 46):—"Roads can never be rendered perfectly secure until the following principles be fully understood, admitted, and acted upon: namely, that it is the native soil which really supports the weight of traffic; that while it is preserved in a dry state, it will carry any weight without sinking, and that it does, in fact, carry the road and the carriages also; that this native soil must previously be made quite dry, and a covering impenetrable to rain must then be placed over it, to preserve it in that dry state; that the thickness of a road should only be regulated by the quantity of material necessary to form such impervious covering, and never by any reference to its own power of carrying weight.—There are some exceptions to this rule; a road of good naturally binding gravel may be laid on a subbed of *bog* earth, which, from its tenacity, will carry all kinds of carriages for many years."

The erroneous opinion so long acted upon, and so tenaciously adhered to, that by placing a large quantity of stone under the roads, a remedy will

be found for the sinking into wet clay or other soft soils; or, in other words, that a road may be made sufficiently *strong*, *artificially*, to carry heavy carriages, though the sub-soil be in a wet state, and by such means to avert the inconveniences of the natural soil receiving water from rain or other causes has produced most of the defects of the roads of Great Britain. At one time, McAdam had formed the opinion that this practice was only a useless expense; but experience has convinced him that it is likewise positively injurious.

If strata of stone of various sizes be placed as a road, it is well known to every skilful and observant road-maker, that the largest stones will constantly work up by the shaking and pressure of the traffic; and that the only mode of keeping the stones of a road from motion is, to use materials of a uniform size from the bottom. In roads made upon large stones as a foundation, the perpetual motion, or change of position of the materials, keeps open many apertures, through which the water passes.

Roads placed upon a hard bottom, it has also been found, wear away more quickly than those which are placed upon a soft soil. This has been apparent upon roads where motives of economy or other causes have prevented the road being lifted to the bottom at once; the wear has always been found to diminish, as soon as it was possible to remove the hard foundation. It is a known fact, that a road lasts much longer over a morass, than when made over a rock. The evidence produced before the committee of the House

of Commons, showed the comparison on the road between Bristol and Bridgwater, to be as five to seven in favor of the wearing on the morass, where the road is laid on the naked surface of the soil, against a part of the same road made over rocky ground.

The common practice, on the formation of a new road, is, to dig a trench below the surface of the ground adjoining, and in this trench to deposite a quantity of large stones; after this, a second quantity of stone, broken smaller, generally to about seven or eight pounds weight: these previous beds of stone are called the bottoming of the road, and are of various thickness, according to the caprice of the maker, and generally in proportion to the amount of money placed at his disposal. On some new roads, made in Scotland in the summer of 1819, the thickness exceeded three feet. That which is properly called the road is there placed on the bottoming, by putting large quantities of broken stone or gravel, generally a foot or eighteen inches thick, at once upon it. Were the materials of which the road itself is composed properly selected, prepared, and laid, some of the inconveniences of this system might be avoided; but in the careless way in which this service is generally performed, the road is as open as a sieve, to receive the water, which penetrating through the whole mass, is received and retained in the trench, whence the road is liable to give way in all changes of weather.

A road formed on such principles, has never effectually answered the purpose which the road-maker should constantly have in view; namely, to make a

secure level flooring, over which carriages may pass with safety and equal expedition at all seasons of the year.

The first operation in making a road should be the reverse of digging a trench. The road should not be sunk below, but rather raised above, the ordinary level of the adjacent ground; care should be taken, at any rate, that there be a sufficient fall to take off the water, so that it should always be some inches below the level of the ground upon which the road is intended to be placed: this must be done, either by making drains to lower the ground; or if that be not practicable, from the nature of the country, then the soil upon which the road is proposed to be laid must be raised by addition, so as to be some inches above the level of the water.

Having secured the soil from under-water, the road-maker is next to secure it from rain water, by a solid road made of clean dry stone or flint, so selected, prepared, and laid, as to be perfectly impervious to water; and this cannot be effected unless the greatest care be taken that no earth, clay, chalk, or other matter, that will hold or conduct water, be mixed with the broken stone; which must be so prepared and laid, as to unite with its own angles into a firm, compact, impenetrable body.

The thickness of such road is immaterial, as to its strength for carrying weight; this object is already obtained by providing a dry surface, over which the road is to be placed as a covering or roof, to preserve it in that state; experience having shown, that if wa-

ter passes through a road, and fills the native soil, the road, whatever may be its thickness, loses its support, and goes to pieces. In consequence of an alteration in the line of the turnpike road, near Rownham Ferry, in the parish of Ashton, near Bristol, it has been necessary to remove the old road. This road was lifted and re-laid very skilfully in 1806; since which time, it has been in contemplation to change the line, and consequently it has been suffered to wear very thin. At present it is not above three inches thick in most places, and in none more than four; yet on removing the road, it was found that no water had penetrated, nor had the frost affected it during the winter preceding, and the natural earth beneath the road was found perfectly dry.

Improvement of Roads, continues McAdam, "upon the principle I have endeavored to explain, has been rapidly extended during the last four years. It has been carried into effect on various roads, and with every variety of material, in seventeen different counties. These roads being so constructed as to exclude water, consequently none of them broke during the late severe winter, (1819—20); there was no interruption to travelling, nor any additional expense by the post-office in conveying the mails over them, to the extent of upwards of one thousand miles of road.

On McAdam's theory the only practical road-maker who has published his opinion is Paterson of Montrose. He says, (*Letters and Communications, &c.* 1822), "These certainly ought to be considered as the grand first principles of road-making." He commends McAdam's reasoning on the principles;

but objects, as we think with reason, to his drainage of three or four inches, as being insufficient. He adds, however, that though he considers McAdam's system as erroneous and defective in draining and preparing the road for the materials, yet, in regard to the materials themselves, the method of preparing and putting them on, and keeping the road free from ruts by constant attention, has his entire approbation. These principles, however, he adds, "are *not new;* but have been acted upon before. In regard to small breaking, he certainly has had the merit of carrying that mode to greater extent than any other individual that I have heard of; and the beneficial effects arising from it have consequently been more extensively seen and experienced." (*Letters on Road-Making*, p. 49.)

One of the most important and most obviously correct of these principles, is that which requires a road to be made of such a degree of substance, as shall be in a due proportion to the weight and number of the carriages that are to travel over it.

But although this is, in appearance, a self-evident proposition, in practice no rule is so universally violated.

Let the construction of any turnpike road, of one commonly considered as among the best, be properly examined; that is, let measure be taken of the quantity of hard-road materials that compose the crust of the road over the subsoil, and it will almost universally be found that it consists of only from three to five, or six inches in thickness. Whereas, instead of this weak and defective system of road-making, it may be laid down as a general rule, that on every main road

where numerous heavy waggons and heavy loaded stage coaches are constantly travelling, the proper degree of strength which such a road ought to have cannot be obtained except by forming a regular foundation constructed with large stones, set as a rough pavement, with a coating of at least six inches of broken stone of the hardest kind laid upon it; and further, that in all cases where the subsoil is elastic, it is necessary, before the foundation is laid on, that this elastic subsoil should be rendered non-elastic by every sort of contrivance; such, amongst others, for instance, as perfect drainage, and laying a high embankment of earth upon the elastic soil, to compress it.

The right understanding of this principle of road-making, which requires roads to be constructed with four or five times a greater body or depth of materials than is commonly given to them, is of such great importance, that it is requisite to illustrate and establish the grounds on which it rests; first, by reference to the laws of science concerning moving bodies, and secondly, by reference to experiments, which accurately prove the force of traction on different kinds of roads.

As a carriage for conveying goods or passengers when put in action becomes a moving body, in the language of science, the question to be examined and decided is, how a carriage, when once propelled, can be kept moving onwards with the least possible quantity of labor to horses, or of force of traction?

Sir Isaac Newton has laid it down as a general principle of science, that a body, when once set in motion, will continue to move uniformly forward in

a straight line by its momentum, until it be stopped by the action of some external force. This proposition is admitted and adopted by all natural philosophers as being perfectly true, and therefore, in order to apply it to roads, it is necessary to enquire what kinds of external force act in a manner to diminish and destroy the momentum of carriages passing over them. With respect to these external forces, the general doctrine is, that they consist of 1st, collision: 2d, friction; 3d, gravity; and 4th, air.

1st, The effect of collision is very great in diminishing the momentum of carriages; it is occasioned by and is in proportion to the hard protuberances and other inequalities on the surface of a road. These occasion, by the resistance which they make to the wheels, jolts and shocks, which waste the power of draught, and considerably check the forward motion of a carriage.

2d, Friction has a very great influence in checking the motion of a carriage; for, when the wheels come into contact with a soft or elastic surface, the friction which takes place operates powerfully in obstructing the tendency of the carriage to proceed; the motion forwards is immediately retarded and would soon cease if not renewed by the efforts of the horses. The "resistance," Professor Leslie says, "which friction occasions, partakes of the nature of the resistance of fluids; it consists of the consumption of the moving force, or of the horses' labor, accasioned by the soft surface of the road, and *the continually depressing of the spongy and elastic sub-strata of the road.*"

An ivory ball, set in motion with a certain velocity over a Turkey carpet, will suffer a visible relaxation of its course; but, with the same impelling force, it will advance further if rolled over a superfine cloth; still further over smooth oaken planks; and it will scarcely seem to abate its velocity over a sheet of pure ice.

This short explanation of the nature and effects of collision and friction is sufficient to show, that smoothness and hardness are the chief qualities to be secured in constructing a road. But perfect smoothness cannot be obtained without first securing perfect hardness, and therefore the business of making a good road may be said to resolve itself into that of securing perfect hardness.

With the view of taking the right course for securing this object, the first thing a road trustee or engineer should do, is to form a correct notion of what hardness is; because the common habit of overlooking this circumstance has been the source of great error in forming opinions upon the qualities of different kinds of roads.

Gravel roads, for instance, to which an appearance of smoothness is given by incurring a vast expense in scraping them, and patching them with thin layers of very small gravel, are very commonly declared to be perfect, and unequalled by any other kind of road. But if the best gravel road be compared with one properly constructed with stone materials, the hardness of the former will be found to be greatly inferior to that of the latter, and the error

of the advocates of smooth-looking gravel roads will be immediately made manifest.

By referring to works of science, it will be seen that hardness is defined to be that property of a body by which it resists the impression of other bodies which impinge upon it; and the degree of hardness is measured by the quantity of this resistance. If the resistance be so complete as to render it totally incapable of any impression, then a body is said to be perfectly hard.

Now this hardness is the hardness which a road ought to have as far as it is practicable to produce it, and it is the chief business of a scientific road maker to do every thing necessary to produce it. For this purpose, when making a new road, he should first select or establish a substratum of soil or earth that is not spongy or elastic, for the bed of the road; and then he should so dispose the materials of which the crust of the road is to consist, as to form a body sufficiently strong to oppose the greatest possible quanity of resistance to the weight of heavy carriages passing over it.

That an elastic subsoil is unfit for a road is evident from the nature of the resistance occasioned by friction, as above described by professor Leslie, and from the terms of the definition of hardness; for however strong the crust of materials may be which is formed over such a subsoil, it will not be capable of opposing a perfect resistance to a heavy moving body. The moving body will sink more or less in proportion as the subsoil is elastic, and the hardness

of the road will be imperfect in proportion as this sinking takes place; so that nothing can be more necessary, as a preliminary step in making a new road, than to take every possible precaution to avoid elastic subsoils, or to destroy the elasticity as much as possible, when no other can be found.

After the engineer has prepared a proper substratum of earth for the bed of a road, he next must construct a crust of road materials in such a manner that, when consolidated, it shall possess such degree of hardness as will not admit the wheels of a carriages to cut or sink into it. For this purpose it will not be sufficient to lay upon the prepared bed of earth merely a coating of broken stones, for the carriages passing over them will force these next the earth into it, and, at the same time press much of the earth upwards between the stones; this will take place to a great degree in wet weather, when the bed of earth will be converted into soft mud by water passing from the surface of the road through the broken stones, into the bed of the road. In this way a considerable quantity of earth will be mixed with the stone materials laid on for forming the crust of the road, and this mixture will make it extremely imperfect as to hardness. It might be possible, in some measure, to cure this defect by laying on a succession of coatings of broken stones; but several of these will be necessary, and, after all, in long continued wet weather, the mud will continue to be pressed upwards from the bottom to the surface of the stones. If even a coating of from sixteen to twenty inches of stones be laid on, it will produce only a

palliative of the evil. So that this plan of making a road will be not only very imperfect, but at the same time very expensive.

Mr. Telford's plan, which has completely succeeded on the Holyhead road, the Glasgow and Carlisle road, and several other roads in Scotland, of making a regular bottoming of rough, close-set pavement, is a plan that secures the greatest degree of hardness that can be given to a road; it is also attended with much less expense than when a thick coating of broken stones is used; for six inches of broken stones is sufficient when laid on a pavement, and the pavement may be made of any kind of common stone.

By laying the stones in making the bottoming with their broadest face downwards, and filling up the interstices closely with stone chips well driven in, the earthy bed of the road cannot be pressed up so as to mix with the coating of broken stones. This coating, therefore, when consolidated will form a solid uniform mass of stone, and be infinitely harder than one of broken stones, when mixed with the earth of the substratum of the road. It is by proceeding in the way here recommended that the friction of wheels on a road will be reduced as much as possible.

To comprehend thoroughly the great importance of making a regular and strong foundation for a road, it should be borne in mind, that roads are structures that have to sustain great weights, and violent percussion; the same rules therefore ought to be followed in regard to them as are followed in regard to other structures.

In building edifices which are to support great weights, whether a church, a house, or a bridge, the primary and indispensible consideration of the architect is to obtain a permanently firm and stable foundation; well knowing that unless this be first substantially made, no future dependence can be placed on the stability of the intended superstructure: but this most requisite precaution has but recently been attended to in the formation of roads, and only on those roads in Scotland, and between London and Holyhead, which have been under the direction of Mr. Telford.

If the foundation of a road be not sufficient and equal to the pressure it has to sustain, the whole fabric, though in other respects ever so well constructed, must fail in permanent stability, and the hardness of it will be imperfect from its elasticity.

DRAINAGE.

In properly constructing this part of the business of road-making, great care is necessary. The utmost judgment of the skilful surveyor will be called into action to enable him to make the best use of the natural facilities of the country, and to overcome the obstructions that he will sometimes meet with. In passing over flat land, open main drains, cut on the field side of the fences, must communicate with the natural watercourses of the country; they should be three feet deep below the level of the bed of the road, one foot wide at bottom, and five feet wide at top.

If springs rise in the site of the road, or in the slopes of deep cuttings, stone or tile drains should be made into them. In cutting, small drains technically called mitre drains, should be formed; the angle, depending on the inclination of the road, should not exceed one inch in 100. They should be 9 inches wide at bottom, 12 inches at top, and 10 inches deep. According to the inclinations of a road, and from the form and wetness of the country, cross drains of good masonry should be built under the road, having their extremities carried under the road fences. One of these should be built wherever water would lie; and when the road passes along the slope of a hill, great numbers are necessary to carry off the water that collects in the channel of the road on the side next the high ground. Various descriptions of drains are made in every situation where necessary, and the preservation of the surface of the road secured by giving it a proper convexity in its cross section.

The proper convex form is particularly essential on hills, in order that the water may have a tendency to fall from the centre to the sides. The side channels, and all the road drains should be repaired at the approach and at the end of winter, and daily attention given to their being free from obstruction. If roads, by a proper system of drainage, be kept dry, they will be maintained in a good state, and at proportionally less expense.

CUTTINGS.

When it is necessary to make a deep cutting through a hill, the slopes of the banks should never be less, except in passing through stone, than two feet horizontal to one foot perpendicular; for though several kinds of earth will stand at steeper inclinations, a slope of two to one is necessary for admitting the sun and wind to reach the road. The whole of the green sod and fertile soil on the surface of the land cut through, should be carefully collected and reserved, in order to be laid on the slopes immediately after they are formed. If enough of these cannot be procured, the slopes should be strewed with mould, and sown with hay-seeds. When stones can be got, the slopes should be supported by a wall raised two or three feet high, at the bottom of them. These walls prevent the earth from falling from the slopes into the side chanels of the road, and add very much to the finished and workmanlike appearance of a road. It is sometimes advisable, particularly if an additional quantity of earth be wanted for an embankment, to make the slopes through the cuttings on the south side of a road of an inclination of three horizontal to one perpendicular, in order to secure the great advantage of allowing the sun and wind to reach more freely the surface of the road. In districts of country where stones abound, expense in moving earth and purchasing land may be avoided, by building retaining walls, and filling between them with earth. In rocky and rugged countries, this is generally the best way of obtaining the prescribed

inclinations. In forming a road along the face of a precipice, a wall must be built to support it. The difficulty of forming a road in such a place, is not so great as may be imagined, for the face of a precipice is seldom vertical, and if the inclination should be half a foot vertical to one foot horizontal, this will admit of a retaining wall being built. By building such a wall, say 30 feet high, and cutting 10 feet at that height into the rock, and filling up the space within the wall, a road of sufficient breadth will be obtained. In forming the bed for the road, material care should be taken, except where cutting into the surface is wholly unavoidable, in order to obtain the proper longitudinal inclinations, to elevate the bed with earth, two feet at least, above the natural surface of the adjoining ground: by following this course, the road will not be affected by water running under or soaking into it from the adjoining land. In arranging the inclinations, they should be obtained by embanking, where that is practicable, in preference to cutting. Almost all old roads across flat and wet land are sunk below the adjacent fields: this has arisen from the continued wearing of them, and carrying away the mud.

No improvement is more generally wanting, than new forming these roads, so as to raise their surfaces above the level of the adjoining land. This would greatly contribute to the hardness of them, to economy in keeping them in repair, and enabling horses to work with the advantage of having sufficient air for respiration.

EMBANKMENTS.

Great care is necessary in making high embankments. No person should be entrusted with these works who has not had considerable experience. The base should be formed, at first, to its full breadth; the earth laid on in regular courses or layers, if not more than four feet in thickness, of a concave form, and no fresh course should be deposited until the preceeding one is firm and consolidated. The slopes at which cuttings and embankments can be safely made entirely depend on the nature of the soil. In the London and plastic clay formations, it will not be safe to make the slopes of embankments or cuttings, that exceed 4 feet high, with a steeper slope than three to one. In chalk or marl, the slopes will stand 1 to 1. In solid sandstone, at ¼ to 1, or nearly vertical. Before quitting this subject, it is proper to remark, that in every instance of deep cutting, the greatest pains should be bestowed in examining the character of the material to be removed: much difficulty will be avoided by proceeding in this way; but on the whole, the best general rule to follow, is always to lay out a line of road, so as to avoid, as much as possible, deep cuttings and high embankments; they are always attended with great expense, and are unavoidably liable to many objections."—*Sir H. Parnell.*

MATERIALS, ETC.

The breadth of roads should vary according to circumstances. In the vicinity of large towns, where the traffic is considerable, the road should, in our opinion, be not less than sixty feet between the fences. Where there is less traffic, fifty feet will be sufficient. The whole breadth should, in these cases be *metalled*, or laid with broken stones. Near London, and other large towns and cities, perhaps 70 feet is not too great a width, and a footpath should be provided on each side. "The road," says Mr. Telford, in a specification for the Holyhead road, "is to be 30 feet wide, exclusive of footpaths, with a fall of 6 inches from the centre to the side channels." The bed of the new road being prepared for the reception of the materials, should, if of a wet or spongy nature, be well '*rammed*' with chips of stone; in some situations it is advisable to lay a stratum of *hand-laid* stones, of from 5 to 7 inches in depth, with their broadest ends placed downwards, and the whole built compactly together. On this is to be laid the '*metal*,' or broken stones, to the depth of at least 8 inches, broken of a uniform size, so as to form a solid and compact body. To insure uniformity in the size of the broken stones, various tests have been suggested; perhaps the most simple is, that every piece shall pass through a ring of 2½ inches in diameter. On this body of metal, no binding or gravel should be used; the angular sides of the metal soon lock into each other, and form a smooth surface. In the selection of road-metal, we prefer the several

varieties of green-stone. The best kinds of these are less friable than granite, when broken into small pieces. It is, however, often necessary, for want of better materials, to use sandstone, common limestone, and chalk, even in districts where there is a great deal of traffic; in some instances, where coal is abundant, sandstone is reduced to a vitreous mass in kilns erected by the road side; but all such road-metal is now used very sparingly in the formation of modern roads, and confined chiefly to the bridle tracks.

"Well-made roads, formed of clean, hard, broken stone," observes Mr. Macneill, "placed on a solid foundation, are very little affected by changes of atmosphere; weak roads, or those that are imperfectly formed with gravel, flint or round pebbles, without bottoming, or foundation of stone pavement or concrete, are, on the contrary, much affected by changes of the weather. In the formation of such roads, and before they become bound or firm, a considerable portion of the sub-soil mixes with the stone or gravel, in consequence of the necessity of putting the gravel on in thin layers: this mixture of earth or clay, in dry, warm seasons, expands by the heat, and makes the road loose and open; the consequence is, that the stones are thrown out, and many of them are crushed and ground into dust, producing considerable wear and diminution of the materials. In wet weather, also, the clay or earth mixed with the stones absorbes moisture, becomes soft, and allows the stones to move and rub against each other, when acted upon

by the feet of horses or wheels of carriages. This attrition of the stones against each other wears them out surprisingly fast, and produces large quantities of mud, which tend to keep the road damp, and by that means increase the injury."

ROADS ABOUT ALBANY.

The principal roads about Albany are from the east, the north and west. The river supplies all the wants of commerce from the south. The road to Troy, though not strictly constructed on the McAdam principle has proved of great benefit to the city. The travelling has increased beyond all calculation, and thousands visit us, who were deterred from doing so by the badness of the old road, during many months in the year. The roads from the east by the way of Bath and Greenbush are turnpikes, and have all the faults and inconveniencies of our common roads. Though not profitable to their proprietors, they are beneficial to the public. Their sphere of attraction is however limited. It is said that the business of the country west of Brainard's bridge is principally transacted elsewhere than in this city. On the other, Sandlake is probably the boundary of the circle in that direction. The old Schenectady turnpike, though its usefulness is lessened by the construction of the Mohawk and Hudson Rail Road, has been of great service to this city, and is an honorable memorial of its early enterprize. The roads towards Cherry Valley and to the south-western villages of this county, are important avenues, but it is said their condition for a great part of the year is such as to direct much of our former business to places lower down on the west bank of the river. Upon personal inquiry I am told that the travelling on the Albany and

Delaware turnpike has latterly fallen off, and that much of the traffic once connected with it has also been diverted to places below this city. The Mohawk and Hudson Rail Road, though it has been unfortunate in many particulars, is still of the utmost importance to our city, and any opposition which tends to impair its utility, must be considered as highly disadvantageous to the interests of this community. Without presuming to meddle with its concerns, we cannot disguise the opinion, that a new stem brought into the city, as by competent engineers it is confidently asserted may be done, which shall enable the company to dispense with the animal power they are now obliged to use in addition to that of steam, is the chief remedy which is to be applied to the evils under which it languishes.

One of the most important routes which has been projected in reference to our city, is that which is to form the western termination of the Railway from Boston via Worcester to the state line. To the line, it is now actually in process of construction, and it remains to be seen, whether we will permit either the city of Troy or Hudson to step in and carry off the eastern trade from us or not. An existing company has been unable to obtain sufficient funds to construct the western part of the line, and sometime ago solicited a subscription from the corporation of the city in aid of its funds. Various circumstances and the peculiar embarrassments of the times have as yet rendered any other step inadmissible than a preliminary survey, and the necessary negociations for the land over which it is to pass. Reports have been made,

meetings held, and calculations published in relation to this work. As long ago as 1829, a gentleman of Boston, Mr. William Jackson, made an appeal to the mechanics of that city in behalf of this enterprise in the shape of a lecture, which deservedly went through two large editions. He assumed the ground, that a railway with double tracks between Boston and Albany, would be like the making of another Hudson river, and the creation of a trade "of great value to Boston, but still greater to Albany."

Two hundred and eighty thousand barrels of flour are annually consumed in Boston. The saving to that city, in the prices asked for this article at seasons when the supply is cut off by the closing of the navigation, or any accidental interruption, he asserts would in a short time pay for the construction of the road. The eastern trade of Vermont, in his opinion, would follow this, in preference to its present overland route. He also estimated that the rise on the real estate of Boston alone would equal three millions of dollars. The number of passengers in that year, between Boston and Albany was 23,000, which according to experience, would be increased three fold, if not four fold in number. The scope of his argument in a political and moral point of view, was still more striking.

The recent calculations of intelligent persons in this city, demonstrate its utility in a striking manner, and to these we would refer all who wish to understand the subject. Would any Albanian hesitate in his support of a project of a second Hudson river, could such a stream have its termination at Boston, and its

sources here? It is to be presumed not; yet such in effect will be the effect of the Rail Road to that city. In fact, the two towns would rapidly approximate in population and resources.

IMPROVEMENT OF ROADS.

BETON.

Immense sums have been expended in France; and by the tenor of an article in *Le Courier des Etats Unis*, of February 26, I discover that these enterprises are pursued with increasing energy, but, by other concurrent sources, of information, we discover that they are by no means confined to France; Belgium, Germany, the Swiss Cantons, Austria, and Russia, all partake, more or less, of this renewed spirit of enterprise. Austria, indeed, has the honor to have constructed the first railroad of any consequence on continental Europe. This road extends about 150 English miles from Budweiss, in Bohemia, through the mountains of Bohemia Wald, to Lintz, in Upper Austria, and on the Danube. Another great line of railroad has been also designed in Austria, which is to extend about *five hundred miles*, from Vienna, over Northern Hungary, to Brody, on the northeastern border of Austrian Poland. Application has again been made to the Emperor of Russia, and favorably received, to construct another railroad of near *four hundred miles*, from Brody to Odessa, on the Black Sea.

The very conception of such improvements would not have been dared even thirty years ago; they are, in their conception alone, independent of even the formation of plans for completion, proof of a most aston-

ishing change in the minds of mankind on continental Europe as to the rational application of their energies and means. A few years past a railroad was projected of about four or five miles in length, in Germany, between Nuremberg and Furth, and in the French paper alluded to we have the following:

"They inform us from Nuremberg that the railroad (le chemin de fer) called the Louis has been completed about three years. Since the 7th of December, 1835, there have passed 1,357,285 on this road between Furth and Nuremberg, and the receipts have amounted to 177,443 florins, ($71,000.) And two circumstances deserving the most particular mention are, that, during three years' use the rails have not received appreciable damage, nor has a single accident put human life in danger."

The Austrian and Bavarian roads many may regard as small beginnings, but they are successful in their operations, and, therefore, morally speaking, they are extremely important examples in the heart of highly civilized communities, and have excited to similar enterprize on a much more extensive scale. The northern part of Italy, or that part occupied by the Po and its confluents, is in an eminent degree favorable to the construction of railroads, and from the source already drawn on we have the following:

"The Constitution (*statuts*) of the Milan and Venice Railroad have been approved by the Austrian Government, and the work is to be commenced in the ensuing spring, (1839.) It is certain that the commerce between Milan and Genoa will be diverted into the new channel from Venice; which latter city be-

ing a free port, colonial articles can be obtained there on better terms than at Genoa. The cars, it is supposed, will occupy about eight hours between Milan and Venice; price of passage for persons, one franc, 18¾ cents."

The distance from Genoa to Milan is about eighty English miles, and from Milan to Venice one hundred and sixty.

My reasons for requesting a place in the National Intelligencer are partly stated, but I was also induced by the following. The original, I may observe, is preceded by several very forcible observations on the great advantages to be derived from the propulsion by steam of carriages on common roads; and I may also premise that the substance called BETON is in fact an an artificial pudding stone or amygdaloid.*

"Of all the enterprises formed to obtain this result, (*moving carriages on common roads,*) there is one which appears to demand public attention in the highest degree; that is, Beton roads. Such roads appear to us destined to resolve that great question in social economy which is now, above all others, of

* Professor D. H. Mahan, of the Military Academy, New-York, in his excellent Treatise on Civil Engineering, gives at page 24 the following components to form Beton:

Hydraulic lime, unslaked	0,30
Sand, middling	0,30
Cement, common clay	0,30
Gravel, course	0,20
Chippings of stone	0,40

This compound would be a true artificial pudding stone, and, no doubt, would admit of other components and proportions, and calls for extended experiments on both its composition and uses.

paramount interest, that is, to construct, at moderate expense, routes admitting facile transport, by steam power.

"A company for the construction of roads in Beton has recently been formed at Paris, under the direction of the honorable M. Garcias, member of the Chamber of Deputies, from the Eastern Pyrenees.

"The roads which this company proposes to construct are to be formed by two different modes of proceeding:

"1st. On land purchased from individuals.

"2d. Along the sides of roads already formed.

"In the first mode, the expense, liberally estimated, would be 170,000 francs per league, about $12,000 per English mile; whilst the second mode will not demand an expenditure exceeding 80,000 francs ($15,000) per league, (5,550 the English mile.) The speed, based upon numerous experiments, is calculated at a mean of six leagues per hour, about 16 English miles."

In the United States the difference of expense between the two modes would probably be less than in France. The article goes on as follows:

"These roads are to be composed of a zone of Beton from 15 to 20 tenths of a metre ($\frac{1}{2}$ to $\frac{3}{4}$ of a foot English) in thickness, equally spread over a surface of $2\frac{1}{2}$ metres, (8 2-10th English feet) in width, and without track or jutting.

"The construction of these roads demands none of the expensive and lengthened studies requisite for constructing railroads. It has been established, experimentally, that the Beton, shortly after being placed,

can support the heaviest carriages without breach or depression; and that, in less than one year, several lines of road may be brought into full use, and this advantage is already felt in all its force. The administrative expense, as also that of repairing, is insignificant when compared with railroads. Again: the Beton roads, to the advantages of celerity, economy of construction, and price of transport, add all the other conditions required at present with so much ardor."

Changing the names of places, the latter part of the preceding quotation would apply to the United States with a force augmented in intensity in proportion to the immense difference in extent of territory compared to that of France.

It may be remarked as amongst the most extraordinary facts in history, that roads have been amongst the most neglected of all those improvements necessary to the inter-communication of mankind. It has not yet been a century since any considerable attention was paid to roads, even in the most densely inhabited sections of Europe. Another circumstance connected with this vital subject may be noticed: that is, the fact that the three monarchs of modern Europe most eminent for military talent and success in war, Peter I. of Russia, Frederick II. of Prussia, and Napoleon, were all still more eminent for their attention to internal improvements. The canal connexion between the Baltic and Wolga has contributed to swell the fame of Peter; the connexions between the Elbe, Oder, and Vistula have done like service to the name of Frederick, whilst the fame of Napoleon is drawn in lines ineffaceable over the Alps. Were it not for the

canals of New-York, the name of De Witt Clinton might fade away with those of others whose fame rests on mere political works. But the man who contributed most to form a water communication between the Atlantic tides and the inland sea of Erie can only be forgotten in the grave of History itself.—*Nat. Intelligencer.*

TRAVELLING AS IT WAS AND AS IT IS.

The following brief summary of a recent journey from New-York to New-Orleans, contrasted with one made in 1800, will perhaps be interesting, and serve to illustrate the modern improvement in travelling.

IN 1800.

"April 3d. Left New-York in ferry boat for Jersey city. Took two-horse coach and got to Philadelphia the fourth day at 4 P. M. Left Philadelphia next morning in a one-horse chaise, with the mail bag behind, for Lancaster, where we arrived the third day. At Lancaster bought a horse, and after a nine days' journey through the forests, reached Pittsburg. Here, with some others, I bought for eighteen dollars, a flat boat, in which we took our departure for New-Orleans, floating with the current. After divers adventures and escapes from great peril by land and water, we reached Natchez in fifty-seven days after leaving Pittsburg, and New-Orleans city in thirteen days thereafter, having been from New-York on the journey eighty-four days, which our friends in New-Orleans did say was an expeditious voyage. My own personal cost on the way was, in sum total, £27 11s. 4½d."

IN 1839.

Left New-York Monday, January 21st, at 6 A. M. in railroad cars at Jersey city. Arrived at Philadel-

phia at ten minutes past 12. Time, 6 hours and 10 minutes.—Cost, $4.

At 2 left Philadelphia in cars for Baltimore. Arrived at 8 P. M. Time, 6 hours.—Cost, $4.

Left Baltimore next afternoon, at 4, in mail chariot for Wheeling. Arrived at Wheeling 5 minutes before 12 Saturday noon. Time 43 hours and 50 minutes.—Cost, $23.

Left Wheeling next morning, in accommodation stage for Cincinnati. Arrived at Cincinnati in 59 hours and 30 minutes. Cost, $24.50.

Left Cincinnati at 10 next morning, in the mail boat Pike, and at 10 at night reached Louisville. Time, 12 hours.—Cost, $4.

Left Louisville next morning at 11, in steamer Diana, and reached Natchez the sixth day. Time, 149 hours.—Cost, $35.

Left Natchez same day, and reached New-Orleans the next evening. Time, 30 hours.—Cost, $10.

Incidental expenses at Philadelphia, Baltimore, Cincinnati, and Louisville, $10.

Total 306 hours 30 minutes.—Cost, $114.50.

Thus making 12 days, 18 hours, and 30 minutes, the time of travel between New-York and New-Orleans. Difference between 1839 and 1800, in time, about 71 days. Difference in expense, about $25 in favor of 1839.

N. B. This last journey was made in the winter season. In the summer months it can be performed for $80, and in less time. The above includes every item, both of expense, "feed and fare."—*Natchez Courier.*

CANALS OF ENGLAND.

The following calculations will show the immense wealth created in England by the spirit of association and of enterprise, which is developed with so much difficulty amongst other nations. It presents a comparison between the first cost of shares in each respective canal, and of the profit realized on stock, according to the actual returns:

	First cost.	Value of stock.
Canal of Coventry - ster'g	£100	£750
" of Mersey - -	100	720
" of Conford - -	100	410
" of Leeds and Liverpool	100	470
" of Monmouthshire -	100	195
" of Trent and Mersey, one-quarter of part	50	650
" of Longborough -	142	2,200
" of Clamorganshire	172	290
" of Warwick & Hampton	100	215
" of Stroudwater -	150	500
" of Shrewsbury -	125	250
" of Birmingham -	17	240
" of Stafford & Worcester	140	550

The capital employed in the prosecution of these canals increased, as their utility and the benefits to be derived from them were made known, to the surprising point at which they are at the present day, being a *quintuple profit.* One hundred pounds sterling invested in such stock yields to its proprietor an interest of more than five times that amount, and a revenue in proportion.

Summary of the amount of Stock issued and authorised to be issued for Banking, for Canals, Rail-Roads, Turnpikes, and for Miscellaneous Objects of the United States.

STATES.	For Banking	For Canals.	For R. Roads	Turnpikes.	Miscel.	Total.
New-York,		13,316,674	$3,787,700		1,158,032	$18,262,406
Pennsylvania,		16,579,527	4,964,484	$2,595,992	3,166,787	27,306,790
Massachusetts,			4,290,000			4,290,000
Maine,					554,976	554,976
Maryland,		5,700,000	5,500,000		292,980	11,492,980
Virginia,		3,835,350	2,128,600	354,800	343,139	6,662,089
South-Carolina,		1,550,000	2,000,000		2,203,770	5,753,770
Ohio,		6,101,000				6,101,000
Kentucky,	$2,000,000	*2,619,000	350,000	2,400,000		7,369,000
Illinois,	3,000,000	*900,000	7,400,000		300,000	11,600,000
Indiana,	1,390,000	6,750,000	2,600,000	1,150,000		11,890,000
Tennessee,	3,000,000	*300,000	3,730,000	118,166		7,148,166
Alabama,	7,800,000		3,000,000			10,800,000
Missouri,	2,500,000					2,500,000
Mississippi,	7,000,000					7,000,000
Louisiana,	22,950,000	50,000	500,000		235,000	23,735,000
Arkansas,	3,000,000					3,000,000
Michigan,		2,500,000	2,620,000		220,000	5,340,000
	$52,640,000	$60,201,551	$42,871,084	$6,618,958	$8,474,684	$170,806,177

* Whole or part for improvement of river navigation.

LAWS OF NEW-YORK.

HIGHWAYS AND BRIDGES.

ART. I.—*Of the officers entrusted with the care and superintendence of highways and bridges; and their general powers and duties.*

SECTION. 1. The commissioners of highways in the several towns in this state, shall have the care and superintendence of the highways and bridges therein; and it shall be their duty,

1. To give directions for the repairing of the roads and bridges, within their respective towns:

2. To regulate the roads already laid out, and to alter such of them as they, or a majority of them, shall deem inconvenient:

3. To cause such of the roads used as highways, as shall have been laid out but not sufficiently described, and such as shall have been used for twenty years but not recorded, to be ascertained, described and entered of record in the town clerk's office:

4. To cause the highways, and the bridges which are or may be erected over streams intersecting highways, to be kept in repair:

5. To divide their respective towns into so many road districts as they shall judge convenient, by writing under their hands, to be lodged with the town

clerk, and by him to be entered in the town book: such divisions to be made annually, if they shall think it necessary, and in all cases to be made ten days before the annual town meeting:

6. To assign to each of the said road districts, such of the inhabitants liable to work on highways, as they shall think proper, having regard to proximity of residence as much as may be: and,

7. To require the overseers of highways, from time to time and as often as they shall deem necessary, to warn all persons assessed to work on highways, to come and work thereon, with such implements, carriages, cattle or sleds as the said commissioners or any one of them, shall direct.

§ 2. The commissioners of highways shall have power, in the manner, and under the the restrictions hereinafter provided, to lay out on actual survey, such new roads in their respective towns as they may deem necessary and proper; and to discontinue such old roads and highways, as shall appear to them, on the oaths of twelve freeholders of the same town, to have become unnecessary.

§ 3. The commissioners of highways of each town, shall render to the board of town auditors at their annual meeting for auditing the accounts of town officers, an account in writing, stating,

1. The labor assessed and performed in such town:

2. The sums received by such commissioners for fines and commutations, and all other moneys received under this Chapter:

3. The improvements which have been made on the roads and bridges in their town, during the year

immediately preceding such report, and an account of the state of such roads and bridges: and,

4. A statement of the improvements necessary to be made on such roads and bridges, and an estimate of the probable expense of making such improvements, beyond what the labor to be assessed in that year, will accomplish.

§ 4. The commissioners of highways of each town shall deliver to the supervisor of such town, a statement of the improvements necessary to be made on the roads and bridges, together with the probable expense thereof; which supervisor shall lay the same before the board of supervisors at their next meeting. The board of supervisors shall cause the amount so estimated, to be assessed, levied and collected, in such town, in the same manner as other town charges; but the monies to be raised in any such town, shall not exceed in any one year, the sum of two hunderd and fifty dollars.

§ 5. It shall be the duty of the commissioners of highways of each town, to cause mile-boards or stones, to be erected, where not already erected, on the post roads, and such other public roads in their town, as they may think proper, at the distance of one mile from each other, with such fair and legible inscriptions as they may think proper.

§ 6. It shall be the duty of the overseers of highways in each town,

1. To repair and keep in order the highways within the several districts for which they shall have been elected:

2. When so required by the commissioners of high-

ways, or any one of them, to warn all persons assessed to work on the highways in their respective districts, to come and work thereon:

3. To cause the noxious weeds on each side of the highway within their respective districts, to be cut down or destroyed twice in each year, once before the first day of July, and again before the first day of September; and the requisite labor shall be considered highway work: and,

4. To collect all fines and commutation money, and to execute all lawful orders of the commissioners.

§ 7. It shall be the further duty of the overseers of highways, once in every month, from the first day of April until the first day of December, to cause all the loose stones lying on the beaten track of every road within their respective districts, to be removed; and to cause the monuments erected or to be erected, as the boundaries of highways, to be kept up and renewed, so that the extent of such roads may be publicly known.

§ 8. When the quantity of labor assessed on the inhabitants of any road district by the commissioners, shall be deemed insufficient by the overseer of such district to keep the roads therein in repair, it shall be the further duty of such overseer, to make another assessment on the actual residents in such district, in the same proportion, as near as may be, and not exceeding one third of the number of days assessed in the same year by the commissioners on the inhabitants of such district; and the labor so assessed by an overseer, shall be performed or commuted for, in like manner as if the same had been assessed by the commissioners of highways.

§ 9. The commissioners of highways of each town, shall cause guide-posts, with proper inscriptions and devices, to be erected at the intersections of all the post-roads in their town, and at the intersection of such other roads therein as they may deem necessary.

§ 10. It shall be the duty of the overseers of highways of each town to maintain and keep in repair, at the expense of the town, such guide-posts as may have been erected by order of the commissioners, within the limits of the districts for which they shall have been respectively elected or appointed.

§ 11. The commissioners of highways, whenever they shall think it necessary or useful, may direct and empower any overseer of highways, in their respective towns, to procure a good and sufficient iron or steel-shod scraper, and plough, or either of them, for the use of his road district; to be paid for, by the moneys arising from commutations and fines within such district.

§ 12. In case such moneys shall be insufficient for the purpose, the deficiency shall be assessed by the overseers upon the inhabitants of the districts, in the proportion they are respectively assessed on the assessment roll of said town; and if any one so assessed, shall neglect or refuse to pay such assessment, the same may be sued for and recovered by the overseer.

§ 13. If any overseer shall be employed more days in executing the several duties enjoined on him by this Chapter, than he is assessed to work on the highway, he shall be paid for the excess at the rate of seventy-five cents per day, and be allowed to retain the same out of the moneys which may come into his

hands for fines under this Chapter; but he shall not be permitted to commute for the days he is assessed.

§ 14. If any person chosen to the office of overseer of highways, shall refuse to serve, or if his office shall become vacant, the commissioners of highways of the town, shall, by warrant under their hands, appoint some other person in his stead; and the overseer so appointed, shall have the same powers, be subject to the same orders, and liable to the same penalties, as overseers chosen in town meetings.

§ 15. The commissioners making the appointment, shall cause such warrant to be forthwith filed in the office of the town clerk, who shall give notice to the person appointed as in other cases.

§ 16. Every overseer of highways who shall refuse or neglect either,

1. To warn the people assessed to work on the highways, when he shall have been required so to do, by the commissioners, or either of them:

2. To collect the moneys that may arise from fines or commutations: or,

3. To perform any of the duties required by this chapter, or which may be enjoined on him by the commissioners of highways of his town, and for the omission of which, a penalty is not hereinafter provided:

Shall, for every such refusal or neglect, forfeit the sum of ten dollars, to be sued for by the commissioners of highways of the town; and when recovered to be applied by them in making and improving the roads and bridges therein.

§ 17. It shall be the duty of the commissioners of

highways of each town, whenever any person resident in their town shall make complaint that any overseer of highways in such town has refused or neglected to perform any of the duties enumerated in the last preceding section, and shall give or offer to such commissioners, sufficient security to indemnify them against the costs which may be incurred in prosecuting for the penalty annexed to such refusal or neglect, forthwith to prosecute such overseer for the offence complained of.

§ 18. If such commissioners of highways shall refuse or neglect to prosecute for such penalty, they shall in every such case, forfeit the sum of ten dollars, to be recovered by the person who shall have made such complaint, and given or offered such security.

ART. II.—*Of the persons liable to work on highways, and the making of assessments therefor.*

§ 19. Every person owning or occupying land in the town in which he or she resides, and every male inhabitant above the age of twenty-one years residing in the town, when the assessment is made, shall be assessed to work on the public highways in such town; and the lands of non-residents, situated in such town, shall be assessed for highway labor, as hereinafter directed.

§ 20. The commissioners of highways of each town shall meet within eighteen days after they shall be chosen, at the place of town meeting, on such day as they shall agree upon, and afterwards at such other times and places as they shall think proper.

§ 21. Each of the overseers of highways shall de-

liver to the clerk of the town, within sixteen days after his election or appointment, a list subscribed by such overseer, of the names of all the inhabitants in his road district, who are liable to work on the highways.

§ 22. The commissioners of highways in each town, at their first or any subsequent meeting, shall make out a list and statement of the contents of all lots, pieces or parcels of land within such town, owned by non-residents therein, every lot so designated shall be described in the same manner as is required from assessors, and its value shall be set down opposite to such description, such value shall be the same as was affixed to such lot in the last assessment roll of the town; and if such lot was not separately valued in such roll, then in proportion to the valuation which shall have been affixed to the whole tract of which such lot shall be a part.

§ 23. The town clerk shall deliver the lists filed by the overseers, to the commissioners of highways of the town; who shall proceed, at their next meeting, or at some subsequent meeting, to ascertain, estimate and assess the highway labor to be performed in their town, the then ensuing year.

§ 24. In making such estimate and assessment the commissioners shall proceed as follows:

1. The whole number of days' work to be assessed in each year shall be ascertained, and shall be at least three times the number of taxable inhabitants in such town.

2. Every male inhabitant being above the age of twenty-one years, (excepting ministers of the gospel

and priests of every denomination, paupers, and idiots and lunatics,) shall be assessed at least one day.

3. The residue of such day's work shall be apportioned upon the estate, real and personal, of every inhabitant of such town, as the same shall appear by the last assessment roll of the said town, and upon each tract or parcel of land, of which the owners are non-residents, contained in the list made as aforesaid:

4. If, after such apportionment, there shall be any deficiency in the number of days' work determined by the commissioners to be performed in their town, the then ensuing year, such deficiency shall be assessed upon the estates, real and personal, of the inhabitants of the town, and upon each tract or parcel of land of which the owners are non-residents, according to the last assessment roll:

5. The commissioners shall affix to the name of each person named in the list furnished by the overseers, and also to the description of each tract or parcel of land contained in the list prepared by them of non-resident lands, the number of days which such person or tract shall be assessed for highway labor, as herein directed, and the commissioners shall subscribe such lists and file them with the town clerk.

§ 25. Lands of non-residents within any town, occupied and improved by the owner or owners, or his or their servants or agents, shall be liable to the same assessments for highways as if the owner or owners were residents.

§ 26. The real property of non-resident owners, improved or occupied by a servant or agent, shall be subject to assessment of highway labor, and at the same rate as the real property of resident owners.

§ 27. The commissioners shall direct the clerk of the town to make a copy of each list, and shall subscribe such copies; after which, they shall cause the several copies to be delivered to the respective overseers of highways of the several districts in which the highway labor is assessed.

§ 28. The names of persons left out of any such list, and of new inhabitants, shall from time to time be added to the several lists, and they shall be rated, by the overseers in proportion to their real and personal estate, to work on the highways, as others rated by the commissioners on such lists, subject to an appeal to the commissioners.

§ 29. Whenever any non-resident owner shall conceive himself aggrieved by the assessments of any commissioners of highways, in carrying into effect the provisions of this Article, it shall be lawful for such owner, or his agent, within thirty days after such assessment, to appeal to any three judges of the court of common pleas of the county in which such land is situated.

§ 30. It shall be the duty of such judges within twenty days thereafter, to convene and decide on such appeal, the said owner or agent giving notice to the commissioners of the time of the meeting of the judges; and their decision, or that of any two of them, shall be final and conclusive in the premises. Each judge shall be entitled to receive for his services on such appeal, two dollars for each day he may be employed thereon, to be paid by the party appealing, if the proceedings of the commissioners and overseers shall be affirmed; but if reversed or modified favora-

ble to the party appealing, to be levied and paid as part of the contingent expenses of such town.

§ 31. It shall be the duty of the commissioners of highways of each town, to credit such persons as live on private roads, and work the same, so much on account of their assessments, as such commissioners may deem necessary to work such private road; or to annex such private roads to some of the highway districts.

§ 32. Whenever the commissioners of highways shall assess the occupant, for any land not owned by such occupant, they shall distinguish in their assessment lists, the amount charged upon such land, from the personal tax, if any, of the occupant thereof. But when any such land shall be assessed in the name of the occupant, the owner thereof shall not be assessed during the same year to work on the highways on account of the same land.

§ 33. Whenever any tenant of any land for a less term than twenty-five years, shall be assessed to work on the highways, for such land, pursuant to the last preceding section, and shall actually perform such work, or commute therefor, he shall be entitled to a deduction from the rent due, or to become due from him, for such land, equal to the full amount of such assessment, estimating the same at the rate of sixty-two and a half cents per day; unless otherwise provided for by covenant or agreement, between such tenant and his landlord.

ART. III.—*Of the duties of overseers in regard to the performance of labor upon highways; and for the performance of such labor or the commutation therefor.*

§ 34. It shall be the duty of the overseers of highways, to give at least twenty-four hours' notice to all persons assessed to work on the highways, and residing within the limits of their respective districts, of the time and place, when and where they are to appear for that purpose, and with what implements; but no person being a resident of the town, shall be required to work on any highway, other than in the district in which he resides, unless he shall elect to work in some district where he has any land; and in such case he may, with the approbation of the commissioners of highways, apply the work assessed in respect to such land, in the district where the same is situated.

§ 35. It shall be the duty of the several overseers of highways, to notify the agent of every non-resident landholder, whose lands are assessed, (if such agent reside in the town where such assessment is made) of the number of days such non-resident is assessed, and of the time when, and the place where the labor is to be performed; which notice shall be given at least five days previous to the time appointed.

§ 36. If the overseer cannot ascertain that such non-resident has an agent within such town, he shall affix a written notice on the outer door of the building in which the last town meeting in such town was held containing a list of the names of such non-residents, when known, and a description of the tracts of land

comprised in his list, together with the number of days' labor, assessed on each tract, and a specification of the time when and the place where such labor is to be performed; which notice shall be posted at least twenty days before the time appointed for performing such labor.

§ 37. Every person liable to work on the highways, shall work the whole number of days for which he shall have been assessed; but every such person, other than an overseer, may elect to commute for the same, or for some part thereof, at the rate of sixty-two and a half cents for each day: in which case, such commutation money shall be paid to the overseer of highways, of the district in which the person commuting shall reside, to be applied and expended by such overseer in the improvement of the roads and bridges in the same district.

§ 38. Every person intending to commute for his assessment, or for any part thereof, shall, within twenty-four hours after he shall be notified to appear and work on the highways, pay the commutation money for the work required of him by such notice; and the commutation shall not be considered as complete until such money be paid.

§ 39. Every overseer of highways shall have power to require a team; or a cart, wagon or plough, with a pair of horses or oxen, and a man to manage them; from any person having the same within his district, who shall have been assessed three days or more, and who shall not have commuted for his assessment; and the person furnishing the same upon such requisition, shall be entitled to a credit of three days for each day's service therewith.

§ 40. Every person assessed to work on the highways and warned to work, may appear in person or by an able bodied man as a substitute; and the person or substitute so appearing, shall actually work eight hours in each day, under the penalty of twelve and a half cents for every hour such person or substitute shall be in default, to be imposed as a fine on the person assessed.

§ 41. If any such person or his substitute shall, after appearing, remain idle, or not work faithfully, or hinder others from working, such offender shall, for every offence, forfeit the sum of one dollar.

§ 42. Every person so assessed and duly notified, who shall not commute, and who shall refuse or neglect to appear as above provided, shall forfeit for every day's refusal or neglect, the sum of one dollar. If he was required to furnish a team, carriage, man or implements, and shall refuse or neglect to comply, he shall be fined as follows:

1. For wholly omitting to comply with such requisition, three dollars for each day:

2. For omitting to furnish a cart, wagon or plough, one dollar for each day:

3. For omitting to furnish a pair of horses or oxen, one dollar for each day:

4. For omitting to furnish a man to manage the team, one dollar for each day.

§ 43. It shall be the duty of every overseer of highways, within six days after any person so assessed and notified, shall be guilty of any refusal or neglect for which a penalty or fine is prescribed in this Title, unless a satisfactory excuse shall be rendered to him

for such refusal or neglect, to make complaint on oath, to one of the justices of the peace of the town.

§ 44. The justice to whom such complaint shall be made, shall forthwith issue a summons directed to any constable of the town, requiring him to summons such delinquent, to appear forthwith before such justice, at some place to be specified in the summons, to shew cause why he should not be fined according to law for such refusal or neglect; which summons shall be served personally, or by leaving a copy at his personal abode.

§ 45. If, upon the return of such summons, no sufficient cause shall be shown to the contrary, the justice shall impose such fine as is provided in this Title for the offence complained of, and shall forthwith issue a warrant under his hand and seal, directed to any constable of the town where such delinquent shall reside, commanding him to levy such fine, with the costs of the proceedings, of the goods and chattels of such delinquent.

§ 46. The constable to whom such warrant shall be directed, shall forthwith collect the moneys therein mentioned. He shall pay the fine when collected, to the justice who issued the warrant, who is hereby required to pay the same to the overseer who entered the complaint, to be by him expended in improving the roads and bridges in the district of which he is overseer.

§ 47. Every penalty collected for a refusal or neglect to appear and work on the highways, shall be set off against the assessment upon which it was founded, estimating every dollar collected as a satisfaction for one day's work.

§ 48. The acceptance by an overseer of any excuse for refusal or neglect, shall not in any case, exempt the person excused from commuting for, or working, the whole number of days for which he shall have been assessed during the year.

§ 49. Every overseer of highways shall, on or before the first day of October, in each year, make out and deliver to the supervisor of his town, a list of all the lands of non-residents, and of persons unknown, which were taxed on his lists, on which the labor assessed by the commissioners of highways has not been paid, and the amount of labor unpaid; and the said overseer, previous to delivering such list, shall make and subscribe an affidavit thereon, before some justice of the peace of such town, that he has given the notice required by the thirty-fifth and thirty-sixth section of this Title, and that the labor for which such land is returned, has not been performed

§ 50. If any overseer shall refuse or neglect to deliver such list to the supervisor, as provided in the last preceding section, or shall refuse or neglect to make the affidavit as therein directed, he shall, for every such offence, forfeit the sum of five dollars, and also the amount of tax or taxes for labor remaining unpaid, at the rate of sixty-two and a half cents for each day; to be recovered by the commissioners of highways of the town, and to be applied by them in making and improving the roads and bridges in such town.

§ 51. It shall be the duty of the supervisors of the several towns, to receive the lists of the overseers of highways, when delivered pursuant to the preceding forty-ninth section, and to lay the same before the board of supervisors of the county.

§ 52. It shall be the duty of such board at their next meeting, to cause the amount of such arrearages of labor, (estimating a day's labor at sixty-two and a half cents) to be levied on the lands so returned, and to be collected in the same manner that the contingent charges of the county are levied and collected, and to order the same, when collected, to be paid over to the commissioners of highways of the town, to be by them applied to the construction and improvement of the roads and bridges in the district, for whose benefit the labor was originally assessed.

§ 53. Every overseer of highways shall, on the second Tuesday next preceding the time of holding the annual town meeting, in his town within the year for which he is elected or apppointed, render to one of the commissioners of highways of the town, an account in writing, verified by his oath, [which the commissioners of highways are authorized to administer,] and containing,

1. The names of all persons assessed to work on the highways in the district of which he is overseer:

2. The names of all those who have actually worked on the highways, with the number of days they have so worked:

3. The names of all those who have been fined, and the sums in which they have been fined:

4. The names of all those who have commuted, and the manner in which the moneys arising from fines and commutations have been expended by him:

5. A list of all lands which he has returned to the supervisor for non-payment of taxes, and the amount of tax on each tract of land so returned.

§ 54. Every such overseer shall also then and there pay to the commissioner, all moneys remaining in his hands unexpended, to be applied by the commissioners in making and improving the roads and bridges in the town, in such manner as they shall direct.

§ 55. If any overseer shall refuse or neglet to render such account, or if having rendered the same, he shall refuse or neglect to pay any balance which may then be due from him, he shall, for every such offence, forfeit the sum of five dollars, to be recovered with the balance of moneys remaining in his hands, by the commissioners of highways of the town, and to be applied in making and improving the roads and bridges. It shall be the duty of the commissioners of highways to prosecute for such penalty in every instance in which no return is made.

§ 56. Whenever it shall appear from the annual return of any overseer of highways, made in pursuance of the fifty-third section of the sixteenth Chapter of Title first of the First Part of the Revised Statutes, that any person who was assessed to work on the highways, (other than non-residents,) has neglected to work the whole number of days to him assessed, and has not commuted for, or otherwise satisfied such deficiency, then it shall be the duty of the commissioners of highways to re-assess such deficiency to the person so delinquent, at the next assessment of work for highway purposes, and to add to it his annual assessment.

§ 57. Such re-assessment shall not exonerate any overseer of highways from any penalty which he may have incurred under the sixteenth section of the last aforesaid Chapter.

ART. IV.—*Of the laying out of public and private roads, and of the alteration or discontinuance thereof.*

§ 58. Every person liable to be assessed for highway labor, may apply to the commissioners of highways of the town in which he shall reside, to alter or discontinue any road, or to lay out any new road. Every such application shall be in writing, addressed to the commissioners, and signed by the person applying.

§ 59. Whenever the commissioners of highways shall lay out, alter or discontinue any road, either upon application to them or otherwise, they shall cause a survey to be made of such road, and shall incorporate such survey in an order to be signed by them, and to be filed and recorded in the office of the town clerk, who shall note the time of recording the same.

§ 60. It shall be the duty of the town clerk, whenever any order of the commissioners, for laying out, altering or discontinuing a road shall be received by him, to post a copy of such order on the door of the house where the town meeting is usually held; and the time hereinafter limited for appealing from any such order, shall be computed from the time of recording the same.

§ 61. No public or private road shall be laid out through any orchard or garden, without the consent of the owner thereof, if such orchard be of the growth of four years or more, or if such garden have been cultivated for four years or more, before the laying out of such road. Nor shall any such road be laid out through any buildings; or any fixtures or erec-

tions for the purpose of trade or manufactures; or any yards or enclosures necessary to the use and enjoyment thereof; without the consent of the owner.

§ 62. No highway shall be laid out through enclosed, improved or cultivated land, without the consent of the owner or occupant thereof, unless certified to be necessary by the oath of twelve reputable freeholders of the town, in the manner hereinafter provided.

§ 63. Every person who shall apply for the laying out of a highway through any such land shall cause notices in writing to be posted up at three of the most public places of the town, specifying, as near as may be, the route of the proposed highway, the several tracts of lands through which the same is proposed to be laid, and the time and place at which the freeholders will meet to examine the ground. Every such notice shall be posted up at least six days before the time specified therein for the meeting of the freeholders.

§ 64. If twelve reputable freeholders of the town, not interested in the lands through which the road is to be laid, nor of kin to the owner thereof, shall appear at the time and place specified in the notice, they shall then be sworn by [a justice of the peace or] any officer authorized to administer oaths, well and truly to examine and certify, in regard to the necessity and propriety of the highway applied for.

§ 65. They shall then personally examine the route of such highway, and shall hear any reason that may be offered for or against laying out the same. If they shall be of opinion that such highway is necesary and proper, they shall make and subscribe a certifi-

cate in writing to that effect, which shall be delivered to the commissioners of highways of the town.

§ 66. Before the commissioners shall determine to lay out the highway so applied for and certified, they shall cause notice in writing to be given to the occupant of the land through which the road is to run, of the time and place at which they will meet to decide on the application. The notice shall be served by delivering the same to such occupant, or if he be absent, by leaving the same at his dwelling-house; and in either case, at least three days before the time of meeting.

§ 67. The commissioners shall meet at the time specified in the notice, and shall hear any reasons that may be offered for or against laying out the highway. If they shall determine to lay out such highway, they shall make out and subscribe a certificate of such determination, describing the road so laid out, particularly, by routes and bounds and by its courses and distance, and shall deposite the same with the town clerk.

§ 68. The damages sustained by reason of the laying out and opening such road may be ascertained by the agreement of the owner and the commissioners of highways, provided such damages do not exceed twenty-five dollars; and unless such agreement be made, or the owner of the land shall in writing release all claims to damages, the same shall be assessed in the manner prescribed in the next section, before such road shall be opened, or worked, or used. Every such agreement and release shall be filed in the town clerk's office, and shall forever preclude such owner from all further claim for such damages.

§ 69. On the application of the commissioners of highways, or of the owner of the land through which such road is laid out, to any two justices of the peace of the town, they shall issue their warrant to some constable of some other town of the same county, neither interested, nor of kin to any person interested, in the land through which the road is laid out; directing him to summon twelve disinterested freeholders, residing in some other town than that in which such road is laid out, and not of kin to the owner of such land, to assess the damages sustained by the laying out such road; and shall therein specify the time and place at which the jury shall meet.

§ 70. Upon such freeholders appearing, the justices who issued the warrant, shall draw by lot, six of the names of the persons attending, to serve as a jury; and the first six persons drawn, who shall be free from all legal exceptions, shall be the jury to assess the said damages.

§ 71. In all cases of the assessment of such damages, the persons by whom the assessment is to be made, shall view and examine the premises; and before making their determination, the freeholders making the same, shall be sworn well and truly to determine and assess such damages.

§ 72. The verdict of the jury assessing such damages, shall be received and certified by the two justices who issued the warrant for summoning them, and shall be delivered by them to the commissioners of highways of the town.

§ 73. Such commissioners shall cause a copy of the said verdict, with a statement of the charges and ex-

penses, to be delivered to the supervisor of the town, who shall lay the same before the board of supervisors of the county. The board shall have power to examine into the principles on which such assessment shall have been made, and into the fairness and justice thereof, and to increase or reduce the damages, as in their judgment shall be just and reasonable.

§ 74. The amount of damages, as finally settled by the board of supervisors, or as liquidated by the commissioners of highways, as provided in the sixty-eighth section of this Title, together with the charges of the commissioners of highways, justices, surveyors and other persons or officers employed in making the assessment, shall be levied and collected in the town within which the highway shall be situated. The moneys so collected, shall be paid to the commissioners of highways of the same town, who shall pay to the owner the sum assessed to him, and appropriate the residue to satisfy the charges.

§ 75. Where any person shall be the owner of any land over which any highway shall run, and such highway shall be discontinued, in whole or in part, by reason of some other road to be established and laid out under this Title, through the lands of the same person, the persons who shall assess the damages shall take into calculation the value of the road so discontinued, and the benefit resulting to such person by reason of such discontinuance, and shall deduct the same from the damages assessed for the opening and laying out such new road; and thereupon the owner of the land may enclose so much of the highway so discontinued, as shall belong to him.

§ 76. When the commissioners of highways of any town shall disagree with the commissioners of any other town in the same county, relating to the laying out of a new road, or the alteration of an old road, extending into both towns; or when the commissioners of a town in one county shall disagree with the commissioners of a town in another county, relative to laying out a new road, or altering an old road, which shall extend into both counties; the commissioners of both towns shall meet together at the request of either disagreeing commissioners, and make their determination upon such subject of disagreement.

§ 77. Whenever it shall become necessary to have a highway upon the line between two towns, such highway shall be laid out by two or more of the commissioners of highways of each of said towns, either upon such line, or as near thereto as the convenience of the ground will admit; and they may so vary the same either to the one or the other side of such line, as they may think proper.

§ 78. It shall be the duty of the same commissioners, when they lay out such highway, to divide it into two or more road districts, in such manner, that the labor and expense of opening, working and keeping in repair such highway, through each of the said districts, may be equal as near as may be, and to allot an equal number of the said districts to each of the said towns.

§ 79. Each district shall be considered as wholly belonging to the town to which it shall be allotted, for the purpose of opening and improving the road,

and for keeeping it in repair; and the commissioners shall cause such highway, and the partition and allotment thereof, to be recorded in the office of the town clerk in each of their respective towns.

§ 80. All highways heretofore laid out upon the line between any two towns, shall be divided, allotted, recorded and kept in repair, in the manner above directed.

§ 81. Whenever application shall be made to the commissioners of highways of any town, for a private road, they shall summon twelve disinterested freeholders of the town where the land through which such road is proposed to be laid out, is situated, to meet on a day certain; of which day, notice shall be given to the owner or occupant of such land. Such freeholders, when met, shall be sworn as above provided, and shall then proceed to view the lands through which such road is applied for.

§ 82. If they shall determine that such road is necessary, they shall make and subscribe a certificate in manner aforesaid, and the commissioners shall thereupon lay out the road, and cause a record thereof to be made in the town clerk's office. The damages of the owner of the land through which such road shall be laid out, shall be ascertained or asssessed in like manner as if the same was a public highway, and such damages shall be paid by the person applying for the road.

§ 83. Every such private road, when so laid out, shall be for the use of such applicant, his heirs and assigns; but not to be converted to any other use or purpose, than that of a road. Nor shall the occupant

or owner of the land through which said road shall be laid out, be permitted to use the same as a road, unless he shall have signified his intention of so making use of the same, to the jury or commissioners, who ascertained the damages sustained by laying out such road, and before such damages were so ascertained.

§ 84. All public roads to be laid out by the commissioners of highways of any town, shall not be less than three rods wide, and all private roads shall not be more than three rods wide.

§ 85. Whenever application shall be made for the discontinuance of an old road, on the ground that it has become useless and unnecessary, the commissioners of highways, to whom such application shall be made, shall summon twelve disinterested freeholders of the town, to meet on a day certain, to consider such application. Such freeholders when met, shall be sworn well and truly to examine and certify in regard to the propriety of such discontinuance.

§ 86. They shall then proceed to view such road, and if they shall be of opinion that the same is useless and unnecessary, they shall make and subscribe a certificate in writing to that effect, which shall be delivered to the commissioners of highways, who shall thereupon proceed to decide upon such application.

§ 87. All applications, certificates and other papers relating to the laying out, altering or discontinuing of any road, shall be filed by the commissioners of highways, as soon as they shall have decided thereon, in the office of the town clerk of the town.

§ 88. Every person who shall conceive himself aggrieved by any determination of the commissioners of highways, either in laying out, altering or discontinuing, or in refusing to lay out, alter or discontinue any road, may at any time within sixty days thereafter, appeal to any three of the judges of the court of common pleas of the county, in which such road is situated. But an appeal by one person, and a decision thereon, shall not conclude nor affect the rights of any other person, who shall appeal within the limited period.

§ 89. The judges to whom the first appeal from any such determination shall be made, shall have exclusive jurisdiction of all appeals from the same determination, to the end that their decision when made may embrace the whole subject; and for this purpose they shall suspend all proceedings upon the appeal first made, and upon all other appeals received by them from such determination, until the time limited for such appeals shall have expired.

§ 90. Every such appeal shall be in writing, addressed to the judges, and signed by the party appealing. It shall briefly state the ground upon which it is made, and whether it is brought to reverse entirely the determination of the commissioners, or only to reverse a part thereof; and in the latter case, it shall specify what part.

§ 91. It shall be the duty of the judges to whom the appeal is made, to proceed thereon as soon as may be convenient. Where the determination appealed from was against an application for laying out, altering or discontinuing a road, the judges shall give notice to

the commissioners by whom such determination was made. Where the appeal is from a determination in favor of an application for laying out, altering or discontinuing a road, the notice shall be given to the commissioners, and to one or more of the applicants for such road. In all cases, the notice shall specify the time and place, at which the judges will convene to hear the appeal.

§ 92. Every such notice shall be served at least eight days before the time mentioned therein, by delivering the same to one of the commissioners whose determination is appealed from, or by leaving the same at his dwelling-house. If the notice be also directed to an applicant, it shall be served in the same manner.

§ 93. It shall be the duty of the judges to convene at the time and place mentioned in the notice, and to hear the proofs and allegations of the parties. They shall have power to issue process to compel the attendance of witnesses, and may adjourn from time to time, as may be necessary. Their decision, or that of any two of them, shall be conclusive in the premises, and every such decision, shall be reduced to writing, be signed by the judges making it, and be filed by them in the office of the town clerk of the town, who shall record the same.

§ 94. Every such judge shall be entitled to receive two dollars for every day employed in the hearing and the decision of such appeal, to be paid by the party appealing where the determination of the commissioner shall be affirmed; but where it is reversed, to be a charge against the county.

§ 95. Where an appeal shall have been made from a determination of commissioners refusing to lay out or alter a road, and the judges shall reverse such determination, such judges shall lay out or alter the road, applied for; and in doing so, shall proceed in the same manner in which commissioners of highways are directed to proceed, in the like cases. Such road shall be opened by the commisssioners of the town, in the same manner as if laid out by themselves.

§ 96. In case the office of any one of the judges to whom such appeal shall be made, shall become vacant before the determination of such appeal, it shall be the duty of the remaining judges named therein, to associate with themselves another of the judges of the same court, who shall act with them in all subsequent proceedings, in the same manner as if he had been originally named in such appeal.

§ 97. No road which has been fixed by the decision of the judges on an appeal to them, shall be discontinued or altered, so long as such judges, or either of them shall continue in commission, except by the order of the same judges, or such of them as continue in commission, joined with such other judge or judges, as shall be necessary to make three; such additional judge or judges, to be selected by the person applying for the discontinuance or alteration.

§ 98. If no one of the said judges shall continue in commission, such application shall be made to any three of the judges of the same court, not having any interest in the road so desired to be discontinued or altered.

§ 99. No application made under either of the two

last preceding sections, shall be acted upon by the judges, unless the same be accompanied by a certificate, signed by the commissioners of highways of the town in which the road is situated, stating their approbation of such application; and before the judges decide thereon, they shall proceed to view the road, so desired to be discontinued or altered. They shall be entitled to the same compensation as above provided, to be paid by the applicant.

§ 100. Whenever the commissioners of highways shall have laid out any public highway, through any enclosed, cultivated or improved lands, in conformity to the provisions of this Title, and their determination shall not have been appealed from, they shall give the owner or occupant of the land through which such road shall have been laid, sixty days' notice in writing, to remove his fences. If such owner shall not remove his fences within the sixty days, the commissioners shall cause such fences to be removed, and shall direct the road to be opened and worked.

§ 101. If the determination of the commissioners shall have been appealed from, then the sixty days' notice shall be given, after the decision of the judges upon such appeal, shall have been filed in the office of the town clerk of the town.

§ 102. The acts and doings of the commissioners of highways of the several towns in this state, or of any two of them, in laying out, altering or discontinuing any road or highway, since the first day of December, one thousand eight hundred and five, and prior to the fourteenth day of April, one thousand eight hundred and twenty-six, are confirmed from

the last mentioned day; provided such commissioners, or any two of them, shall have caused a survey of such roads or highways to be filed and recorded in the office of the town clerk of the town. But such confirmation shall not affect any decision of the judges of the court of common pleas, made prior to the fourteenth day of April, one thousand eight hundred and twenty-six, confirming or reversing the determination of the said commissioners; nor any appeal from such determination, made within six months after that day; nor any suits or proceedings which on that day were pending, at law or in equity.

§ 103. Every public highway already laid out, that shall not have been opened and worked within six years from the time of its being so laid out, and every such highway hereafter to be laid out, that shall not be opened and worked, within the like period, shall cease to be a road for any purpose whatever.

§ 104. All public highways now in use, heretofore laid out and allowed by any law of this state, of which a record shall have been made in the office of the clerk of the county or town; and all roads not recorded, which have been or shall have been used as public highways, for twenty years or more; shall be deemed public highways, but may be altered in conformity to the provisions of this Title.

§ 105. It shall be the duty of the commissioners of highways, to order the overseers of highways to open all roads to the width of two rods at least, which they shall judge to have been used as public highways for twenty years.

ART. V.—*Regulations and penalties concerning the obstructions of highways, and encroachments thereon.*

§ 106. Whoever shall obstruct any highway, or shall fill up or place any obstruction in any ditch constructed for draining the water from any highway, shall forfeit for every such offence, the sum of five dollars.

§ 107. In every case where a highway shall have been laid out, and the same has been or shall be encroached upon by fences, erected by any occupant of the land through or by which such highway runs, the commissioners of highways of the town, shall, if in their opinion it be deemed necessary, order such fences to be removed, so that such highway may be of the breadth originally intended. The commissioners making the order, shall cause the same to be reduced to writing, and signed. They shall also give notice in writing, to the occupant of the land, to remove such fences within sixty days. Every such order and notice shall specify the breadth of the road orginally intended, the extent of the encroachment, and the place or places in which the same shall be.

§ 108. If such removal shall not be made, within sixty days after the service of such notice, the occupant to whom the notice shall be given, shall forfeit the sum of fifty cents for every day, after the expiration of that time, for which such fences shall continue unremoved.

§ 109. If the occupant to whom notice is given, shall deny such encroachment, the commissioners, or some one of them, shall apply to any justice of the

peace of the county, for a precept directed to any constable of the town, to summon twelve freeholders thereof, to meet at a certain day and place, to be specified in such precept, and not less than four days after the issuing thereof, to inquire into the premises. The constable to whom such precept shall be directed, shall give at least three day's notice to the commissioners of highways of the town, and to the occupant of the land, of the time and place at which such freeholders are to meet.

§ 110. On the day specified in the precept, the jury so summoned, shall be sworn by such justice, well and truly to inquire whether any such encroachment has been made, and by whom. Such witnesses as may be produced by either party, shall also be sworn by such justice; and the jury shall hear the proofs and allegations which may be produced and submitted.

§ 111. If the jury find that any encroachment has been made, they shall make and subscribe a certificate in writing, stating the particulars of such encroachment, and by whom made; which shall be filed in the office of the town clerk. The occupant of the land, whether such encroachment shall have been made by him, or by any former occupant, shall remove his fences within sixty days after the filing of such certificate, under the penalty provided in the one hundred and eighth section of this Title. He shall also pay the costs of such inquiry; and if the same shall not be paid within ten days, the justice shall issue a warrant for the collection thereof, in the manner provided in the forty-fifth section of this Title.

§ 112. If the jury find that no encroachment has been made, they shall so certify, and shall also ascertain and certify the damages which the then occupant shall have sustained by such proceeding; which, together with the costs thereof, shall be paid by the commissioners, and shall be a charge in their favor against the town by which they shall have been elected.

§ 113. No person shall be required to remove any fence under the preceding provisions of this Article, except between the first day of April and the first day of November in any year.

§ 114. If any tree shall fall, or be fallen by any person from any enclosed land into any highway, any person may give notice to the occupant of the land from which such tree shall have fallen, to remove the same within two days. If such tree shall not be removed within that time, but shall continue in such highway, the occupant of the land shall forfeit the sum of fifty cents for every day thereafter, until such tree shall be removed.

§ 115. In case any person shall cut down any tree on land not occupied by him, so that it shall fall into any highway, river or stream, unless by the order and consent of the occupant, the person so offending, shall forfeit to such occupant, the sum of one dollar for every tree so fallen, and the like sum for every day the same shall remain in such highway, river or stream.

§ 116. Whoever shall cut, or cause to be cut down, any tree, so that the same shall fall into any river or stream, which now is or hereafter shall be declared a public highway, and shall not remove the same out

of such river or stream, within twenty-four hours thereafter, shall forfeit five dollars for every tree so cut down and left remaining.

§ 117. No swinging or other gates shall be allowed on any public highway, laid out by virtue of this Title, or which has heretofore been laid out, other than such public highways as run through lands liable to be overflowed by the waters of the adjacent rivers or streams, in such manner as to remove the fence thereon.

§ 118. Such gates shall be erected and kept in good repair, by the overseers of highways of the town, at the proper costs and charges of the occupant of the land, for whose benefit the same shall be erected.

§ 119. If more than one gate shall be erected, and the intermediate land between the gates, at the extremities of such lands, shall be in the occupation of more than one person benefitted by such gates, the whole charge of erecting and keeping the same in repair, shall be borne by all the occupants benefitted thereby, in proportion to the extent of land each occupies adjoining the highway, between the gates at the extremities aforesaid.

§ 120. The overseer of every road district in which such gates shall be, shall, on or before the first day of November in every year, make out and file with the town clerk, a statement of the charges incurred in the erection or repairing of such gates, with the name of the person bound to defray the same; which account shall be verified by the oath of such overseer. If more than one person is liable to defray such charges, the statement shall also contain an apportionment

thereof between such persons, stating the amount to be paid by each.

§ 121. The overseer shall, within ten days after filing the statement, demand of every person bound to pay such charges, or to contribute thereto, the sum due from him according to such statement; and if any person shall refuse or neglect to pay such moneys within six days after demand, it shall be the duty of the overseer to make complaint to a justice of the peace of the town, and the like proceedings shall be had for the recovery of such moneys, as in the recovery of fines, for refusing or neglecting to work on the highways.

§ 122. The commissioners of highways shall file an account of such gates in the town clerk's office; and if any person shall open any such gate, and shall not, immediately after having passed the same, close it, or shall wilfully or unnecessarily ride over any grounds adjoining the road on which such gates shall be permitted, he shall forfeit to the party injured, treble damages.

TURNPIKE CORPORATIONS.

ART. I.—*Of the mode of incorporating Turnpike Companies, and of the choice and powers of the directors.*

SECTION 1. All such persons as shall hereafter be incorporated by an act of the legislature, for the purpose of making a turnpike road, shall be a body corporate, by the name given in the act of incorporation; and as such, they and their successors shall have power to purchase, hold and enjoy such real and personal estate, not exceeding the amount to be prescribed in such act, as shall be necessary to fulfil the ends of their incorporation.

§ 2. Each of the persons who shall be named in such act, as a commissioner for receiving subscriptions, shall furnish himself with a book for that purpose, which shall be kept open for two years, unless one-sixth of the whole number of shares shall be sooner subscribed.

§ 3. Each subscriber shall pay to the commissioner receiving his subscription, and at that time, on each share that he shall subscribe, one-tenth of the sum fixed in the act of incorporation, as the amount of one share, and the residue to the president and directors to be elected, at such time and place, as they shall from time to time require. The shares subscribed shall be deemed and considered to be personal estate.

§ 4. As soon as one-sixth part of the whole number

of shares fixed in such act, as the capital of the corporation, shall have been subscribed, the commissioners shall, by advertisement to be published in two of the public newspapers printed nearest to the route of the road, give at least thirty days' notice, of the time and place, when and where, the subscribers shall meet to choose directors.

§ 5, At the election so appointed, the commissioners present shall preside; and the subscribers present, or their proxies, by a plurality of votes, shall elect by ballot nine stockholders, to be directors of the corporation for the ensuing year.

§ 6. The commissioners shall deliver their respective subscription books, to the directors so chosen at their first meeting, and shall then pay over to such directors, the moneys received by them, respectively, on such subscriptions.

§ 7. An election for directors shall thereafter be annually held, on the same day of the same month on which the first election was held; and at each election, including the first, the stockholders present, by a plurality of votes, shall elect by ballot, three persons, to preside at the next succeeding election.

§ 8. If an annual election shall not be held on the day fixed by law, it shall be held in the same manner, and with the like effect, on some early day, to be appointed by the directors then in office, who shall give and publish the same notice thereof, as is required in respect to the first election; and who after the day on which such election ought to have been held, shall be incapacitated from doing any act as directors, except such as may be necessary to give effect to the election so to be appointed.

§ 9. The persons presiding at each election, shall immediately after receiving the ballots, openly estimate the votes, and thereupon make and subscribe a certificate of the result. Of the first election, they shall make a return to the directors chosen, at their first meeting thereafter.

§ 10. Each stockholder, in person or by proxy, shall, at each election, be entitled, on the shares then held by him, to one vote for each share, to the number of ten, and for every five shares above that number, to one additional vote.

§ 11. Five directors shall be a board for the transaction of business, and the acts of a majority of the board shall bind the corporation.

§ 12. The directors, at their first meeting after their election, shall elect by ballot one of their number as president.

§ 13. The board shall supply every vacancy that may occur in the office of a director, and the person chosen shall hold his office until the next annual election. They shall also supply from the directors, every vacancy that shall occur in the office of president; and one of the members present shall be chosen by a plurality of votes, to preside at every meeting of the board, from which the president shall be absent.

§ 14. The president and directors shall have power, and it shall be their duty,

1. To meet from time to time, at such place as they may deem expedient:

2. To make such by-laws, rules and regulations, as in their judgment, the affairs of the corporation shall require:

3. To appoint such subordinate officers, artists and workmen, as they shall deem necessary to execute the business of the corporation:

4. To continue to receive subscriptions of shares, until their whole capital stock shall be subscribed, unless it shall have been ascertained, that a less sum will be sufficient to fulfil the ends of their incorporation:

5. To demand at such time and in such proportion as they shall see fit, from the respective stockholders, the sums of money due on their respective shares, under pain of the forfeiture of such shares, and of all previous payments thereon, to the corporation:

6. To declare by a by-law in what manner and under what restrictions, the shares of their capital stock shall be transferrable:

7. To construct, complete, and keep in constant repair, the road, with all the necessary buildings and appurtenances, for the making of which they shall have been incorporated:

8. To keep a fair and just account of all tolls received, and of all moneys disbursed, and deducting costs and charges, to make and declare a dividend of the clear profits and income of the road, among the stockholders, on the first Tuesday of May, and the first Tuesday of November, in every year:

9. To publish a notice of each dividend, in one or more of the public newspapers printed nearest to the route of the road, and of the time and place of the payment thereof, and to pay the same accordingly:

10. To report to the comptroller, within six months after the road shall be completed, an account of the

expenses of its construction, and to exhibit annually to the comptroller, an account of the sums arising from the tolls, of the disbursements and of the dividends actually made within the year.

§ 15. Every company so incorporated shall cease to be a body corporate,

1. If within two years from their incorporation, they shall not have commenced the construction of the road described in the act of incorporation: and

2. If within five years from such incorporation, such road shall not be completed according to the provisions of this Title, and of the act of incorporation.

§ 16. Every such corporation may be dissolved by the legislature, when by the income arising from tolls, it shall have been compensated for all moneys expended in purchasing, making, repairing and taking care of its road, and have received in addition thereto, an average annual interest at the rate of ten per cent; and on such dissolution, all the rights and property of such corporation, shall vest in the people of this state.

ART. II.—*Of the construction of the road, and of the appraisement of damages.*

§ 17. The road directed to be made by each company so incorporated, shall be laid out by three, or any two of three, commissioners to be appointed by the governor: such commissioners must not be interested in any turnpike road, nor live in a county through which the road directed shall pass.

§ 18. It shall be the duty of such commissioners,

1. To lay out the road directed, without favor or

partiality, according to their best judgment and understanding, in such manner as shall best promote the objects of the corporation, and the interests of the public:

2. To cause to be made an accurate map of their survey of such road, in every county through which it shall pass, designating therein the several particular points near or through which it passes, and to deposit and file such map in the office of the clerk of the county.

§ 19. Each commissioner, for each day he shall be necessarily employed in the performance of such duty, shall receive the sum of three dollars, to be paid, together with the expenses of surveys and maps, by the corporation to which the road shall belong.

§ 20. Such road shall be constructed by the president and directors of such corporation, in the manner following:

1. It shall be laid out not less than four rods wide, and twenty-two feet of such width shall be bedded with stone, gravel, sound wood, or other hard substance, well compacted, and of sufficient depth to secure a good and solid foundation;

2. It shall be faced with gravel or broken stone, of a depth not less than nine inches, in such manner as to secure a firm and even surface, rising in the middle by a gradual arch:

3. The ditches on each side thereof shall, when practicable, be so made, as to render easy the passing of sleighs therein, and shall be so formed as to permit carriages conveniently to pass on and off the turnpike, where it shall be intersected by other roads.

4. It shall be made of such width as may be practicable, not less than twenty-two feet in any one place; and without a ditch on the lower side in each place where, on account of the steepness of side-hills or rocks, it cannot, in the opinion of the commissioners, be made of the full width above required:

5. The lower side, where it shall not be of full width, shall be furnished with a strong and sufficient fender or railing, of the height of at least four feet above the surface of the road along which such fender shall be constructed.

§ 21. A mile stone or post shall be erected and maintained by the corporation on each mile of the road, on which shall be fairly and legibly marked or inscribed, the distance of such stone or post from the place of the commencement of the road; and when such road shall commence at the end of any other road, having mile stones or posts, on which the distance from any city or town is marked, a continuation of that distance shall in like manner be inscribed.

§ 22. A guide post shall also be erected at the intersection of every public road, leading into or from the turnpike, on which shall be inscribed the name of the place to which such intersecting road leads, in the direction to which the name on the guide post shall point.

§ 23. No director of the corporation to which it shall belong, shall be concerned directly or indirectly in any contract for the making or working of the road, or any part thereof, during the time he shall be a director.

§ 24. No contractor for the making of such road, or

any part thereof, shall make a new contract for the performance of his work, or any part thereof, other than by hiring hands, teams, carriages or utensils, to be superintended and paid by himself, unless such new contract and its terms be laid before the board of directors, and be approved by them.

§ 25. After the road shall have been laid out by the commissioners, the president and directors of the company to which it shall belong, may agree with the owners of the land through which it shall pass, for the purchase of so much thereof as shall be necessary for the making of the road, and the accommodation of gates, toll-houses, and other works thereto belonging.

§ 26. In every case where the owner of land so required, shall be absent from the county, or shall not from any cause be capable in law, so to agree, or shall refuse to agree, the value of such land, and the damages to the owners, shall be ascertained, in the manner following:

1. One of the judges not interested in the road, of the court of common pleas of the county in which the land shall be situated, upon application of the president and directors, shall by an instrument in writing, signed by him, appoint three freeholders of the county, not inhabitants of any town through which the road shall pass, and not interested in the road or lands to be appraised, as appraisers.

2. The president and directors shall give notice to the appraisers of their appointment, and the appraisers, or any two of them, shall thereupon name a day for meeting on the land, and performing the duties re-

quired of them; which day shall not be more than twenty, nor less than ten days, from such notice of their appointment.

3. The president and directors shall give at least ten days' notice to the owners of the land required, of the time and place of meeting, so appointed by the appraisers; but if any such owner be absent, or subject to any legal disability to contract, a copy of such notice may be left at the dwelling-house of such owner, or at some public place on the lands to be appraised.

4. Each appraiser, before he shall proceed to execute his trust, shall take and subscribe in writing, before a justice of the peace in the county, the oath or affirmation prescribed in the constitution of this state.

5. The appraisers shall then proceed to view the premises, and without favor or partiality, to assess the damages sustained by the respective owners of the lands deemed necessary by the president and directors, to be taken and appropriated for the road.

6. They shall make an inquisition, under their hands and seals, or the hands and seals of any two of them, describing such land, and stating the amount of damages, if any, which each owner of lands or improvements so taken and appropriated, has sustained, or will sustain, in consequence thereof:

7. The inquisition shall be acknowledged by the appraisers signing it, before one of the judges of the county in which the lands are situated, and so acknowledged, shall be filed by them, together with their oath or affirmation of office, in the clerk's office of such county, within thirty days after it shall have been made, to be by such clerk recorded in a book for recording deeds, at the expense of the corporation.

§ 27. The president and directors, upon payment of the several sums so assessed as damages, in the inquisition so made, or upon making a legal tender thereof, when the moneys shall be refused, shall be entitled to enter on the lands described in the inquisition, and shall have and hold the same, to them, their successors and assigns forever.

§ 28. If on any parcel of the lands so described, there shall be no person then living, authorized to receive the damages assessed for such parcel, and such damages shall not have been lawfully demanded, within ten days after the filing of such inquisition, the president and directors may enter thereon, without payment or tender of such damages; but subject to such payment whenever the same shall be thereafter lawfully required.

§ 29. Such president and directors shall not enter on and take possession of any public highway, until it shall have been appraised and paid for, in the same manner as private property, and the amount appraised for each highway so taken, shall be paid to the commissioners of highways in the town to which it shall belong, to be by them applied in improving the roads in such town.

§ 30. Whenever an appraisement shall be made of the lands on any old road, used as such by prescription, on which a turnpike shall be laid out, the appraisers shall set down the value of the soil and of the improvements, and the moneys paid by any town for making such improvements, in separate sums; and the sum for which the soil is appraised shall be paid to the owners thereof, and the value of the improve-

ments, and the sums paid therefor, by any town, shall be paid to the commissioners of highways of the town in which such old road shall be situated.

§ 31. The president and directors procuring the appointment, shall pay to the judge for appointing appraisers, one dollar, and to each appraiser, two dollars for every day he shall be necessarily employed in his duties as such.

ART. III.—*Of tolls, and their collection.*

§ 32. As soon as the president and directors of any company incorporated under this Title shall have completed their road, or any ten miles thereof, they shall give notice thereof to the governor, who shall thereupon appoint three discreet freeholders, not interested in any turnpike, to view the road as described in the notice, and to report to him, in writing, whether the same is completed in a workmanlike manner, according to the requisitions of this Title, and of the act of incorporation.

§ 33. If such report shall be in the affirmative, it shall be the duty of the governor, by license under his hand, and the privy seal of the state, to permit the president and directors to erect so many gates and turnpikes on the road reported, as shall be sufficient for the collection thereon, of the tolls authorized by law.

§ 34. The president and directeors shall then appoint toll-gatherers to collect, at each gate so erected, from the persons using the road, such toll as shall be authorized in their act of incorporation.

§ 35. Each toll-gatherer may detain and prevent

from passing through his gate, the persons riding, leading or driving animals or carriages subject to toll, until they shall have paid respctively the tolls authorized by law.

§ 36. No tolls shall be collected at any gate of any company incorporated under this Title in either of the following cases:

1. From any person passing to or from public worship, or a funeral; to or from a grist mill for grinding of grain for family use; or to or from the blacksmith's shop to which he usually resorts for work there to be done.

2. From any person going for a physician or midwife, or returning from such errand; going to or returning from court when legally summoned as a juror or witness; going to or returning from a militia training, which by law, he is required to attend; or going to a town meeting or election at which he is entitled to vote, for the purpose of giving such vote, and returning therefrom:

3. From any person residing within one mile of the gate at which toll is demanded, unless he shall be employed in the carriage or transportation of the property of other persons, not so residing:

4. From troops in the service of this state, or of the United States.

§ 37. From carriages having wheels, of which the tire or track is,

1. Twelve inches wide, no tolls:

2. Nine inches wide, one-fourth only of the tolls otherwise payable:

3. Six inches wide, one-half only of such tolls,

Shall be collected.

§ 38. It shall be the duty of the president and directors, to affix and keep up, at or over each gate, in some conspicuous place, so as to be conveniently read, a printed list of the rates of toll demandable at such gate.

ART. IV.—*General provisions embracing corporations now existing.*

§ 39. In each county of this state, in which there is or shall be any turnpike road, there shall be not less than three, nor more than five inspectors of turnpikes, neither of whom shall be interested in any turnpike within the state.

§ 40. The persons appointed to such office, shall be the inspectors of all the turnpike roads within their county, except in cases where, by the act of incorporation, a special provision for the inspection of the road is made. But where the president, directors and company of any turnpike shall have refused or neglected to obtain the appointment of inspectors of their road, or when there shall be no inspectors of such road in office, or those in office shall refuse or neglect to serve when called upon, the county inspectors, shall, in respect to such turnpike, exercise all the powers conferred by this Article, until inspectors for such road shall be appointed according to the act incorporating the same, and until such inspectors shall accept their appointment and agree to serve.

§ 41. It shall be the duty of each inspector to whom a complaint in writing shall be made, that a turnpike road, or a part of such road, in his county is out of repair, without delay to view and examine the road

complained of; and if he shall find such complaint to be just, he shall give notice in writing of the defect, to the toll-gatherer, or person attending the gate nearest to each place out of repair, and in such notice, may, in his discretion, order such gate to be thrown open; but no inspector or inspectors shall order such gate to be opened, unless a notice in writing shall have been served on the gate-keeper nearest to the place out of repair, particularly describing such place, at least three days previous to making such order.

§ 42. Immediately after the service of such notice, each gate ordered to be thrown open, shall be opened; nor shall it be again shut, nor any toll be collected thereat, until one of the inspectors for the county, shall have granted a certificate, that the road is in sufficient repair, and that such gate ought to be closed.

§ 43. Whenever any part of a turnpike road shall be out of repair, and the gate to which it has relation, is situated in an adjoining county for which inspectors shall have been appointed, such inspectors, upon a complaint in writing, shall view and examine the road complained of, and proceed thereon according to the provisions of this Article, in like manner as if the road so complained of was within the county where such gate is situated.

§ 44. Every keeper of a gate ordered to be thrown open, who shall not immediately obey such order, or who shall not keep open such gate until a certificate permitting it to be closed shall be granted, or who, during the time such gate ought to be open, shall hinder or delay any person in passing, or take or demand any tolls from any person passing, shall, for each of-

fence, forfeit the sum of ten dollars to the party aggrieved.

§ 45. It shall be the duty of each inspector, who, upon due examination, shall have discovered a turnpike road within his county to be out of repair, or that any gate theron is placed in a situation contrary to law, to give notice in writing of such defect or default, to one or more of the directors of the company to which such road shall belong.

§ 46. In such notice, he shall require the defective road to be repaired, or the gate improperly placed to be removed, within a certain time to be fixed in the notice; and in his discretion, may order, that in the mean time, the gates on such road, or such of them as he shall specify, be thrown open.

§ 47. If the requisitions of such notice be not obeyed, it shall be the duty of such inspector, to make immediate complaint to the attorney-general, or the district attorney for the county, whose duty it shall be to prosecute the delinquent company, in the name of the people of this state. Such corporation, if convicted of having suffered their road to be out of repair, or having placed one or more of the gates thereon in a situation contrary to law, shall be fined in a sum not exceeding two hundred dollars.

§ 48 To each inspector of turnpikes, who shall view a turnpike road upon complaint made to him, shall be allowed the sum of two dollars for each day spent by him in the performance of such duty. If he shall adjudge the road viewed to be out of repair, such fees shall be paid by the company to which the road shall

